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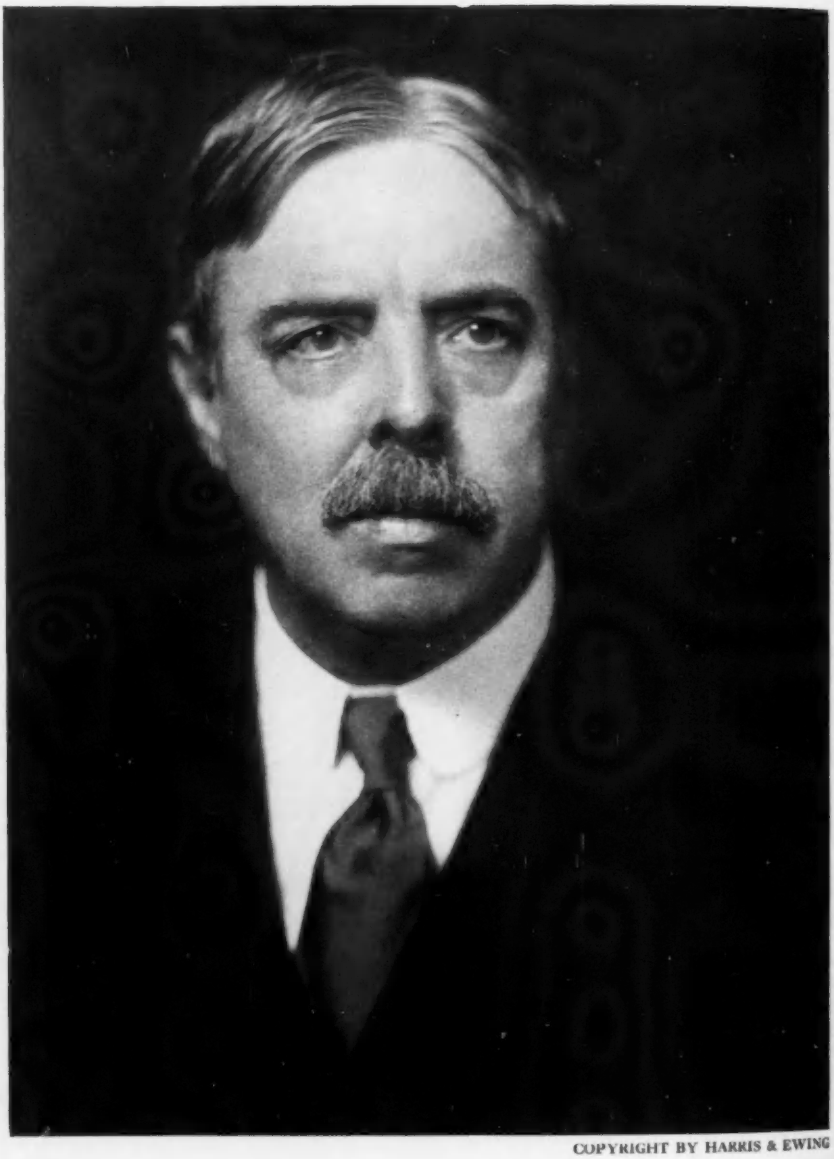

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E. L. Thorndike

VOLUME 41 NUMBER 8

Teachers College
RECORD

May 1940

In Honor of E. L. Thorndike

INTRODUCTORY NOTE

THE papers included in this volume have been prepared to commemorate the fortieth anniversary of the appointment of Edward Lee Thorndike to a professorship in Teachers College. The year 1940 also marks, however, the forty-second year of his teaching connection with the College—hence the included bibliography dates from 1898.

If every student, friend, co-worker, and assistant who has felt a sense of indebtedness to Dr. Thorndike for help received during these years had written but one line to testify to his gratitude, this volume had been a library. It may well be remembered therefore that this issue of the TEACHERS COLLEGE RECORD, which attempts to analyze certain phases of Dr. Thorndike's work, carries a weight of appreciation from a multitude proud to have come within the potent circle of his influence.

The stimuli Dr. Thorndike has set in motion have resulted in responses that have made in unnumbered folk bonds of affection as well as of action. The satisfying nature of the relationship thus experienced has tended to spread the learning achieved over enlarging areas of individual performance and social utility. It would be difficult if not impossible to name any country on the planet in which there are not those whose thoughts turn in gratitude and good will to the man to whom this volume is dedicated. For beyond all that he has done in these forty odd years has been the man—creative, kindly, just, hard-working, free-handed—himself a greater benefaction to the race than any of his works.

An Appreciation of E. L. Thorndike
1926 and 1940

1926*

THE Teachers College Record, as its name indicates, is intended to carry to our alumni a record of what the College is doing. For twenty-five years it has been more or less successful in portraying the material accomplishments of the institution, but no mere printed statement can adequately reflect the spirit of the place. The spirit of the College, that something which gives it personality and marks it for our own, is embodied in the lives of the members of our staff. There is a reason, therefore, why this number of THE RECORD should be devoted to the life and works of one man—one whose term of service is contemporaneous with the life of this journal and whose personality has pervaded the institution from the day he entered it to the present moment. In developing the subject of educational psychology and in making it a fit study for students in all departments, Professor Thorndike has shaped the character of the College in its youth as no one else has done and as no one will ever again have the opportunity of doing. It may be too early to weigh properly the results of his work, but it is not too soon to give his friends and students this opportunity to pay their tributes to a man whose teachings already have a sure place in the history of education.

My acquaintance with Dr. Thorndike began with a visit which I made to his classroom in Cleveland where he taught the year following the taking of his Doctor's degree in Columbia University. I knew of him as a student who had made a study of the behavior of monkeys—a pretty good stepping-stone, it seemed to me, to a study of the nature and behavior of children. At that time neither the term nor the subject of

* The February, 1926, issue of the TEACHERS COLLEGE RECORD, in which this appreciation by Dean James E. Russell first appeared, was published to mark Dr. Thorndike's twenty-fifth anniversary at Teachers College.

educational psychology had been created; but I had a notion that a field of study so obviously fundamental to educational theory and practice should have both a name and a sponsor in the kind of teachers college which I was planning. After listening to one class exercise, I was satisfied that I had found the right man for the job. I promptly offered him an instructorship and he as characteristically accepted it at once. Whether he has ever regretted such unseemly academic haste I do not know, but I do know that no hour of my life has been more profitably spent. Quick to size up a problem, however novel and strange it might appear, clear and direct in his thinking about it, almost uncanny in his methods of approach to a solution of it, prompt and positive in giving his conclusions once he had worked his way through it—these traits were as characteristic of him at the beginning of his career as they have come to be peculiarly his own in later years. These traits would have made him a leader in finance, in industry, or in trade, had he chosen to give himself to business instead of to science and education. His mental equipment and his methods of work would have made for success in almost any field of human endeavor.

To me, however, it is Professor Thorndike's personality that makes the greatest appeal, a personality that most markedly differentiates him from men of small caliber and really constitutes his true greatness. Were he to lack this something which is so hard to define, he might have been both a clever and an efficient leader but lacking, nevertheless, in those qualities which endear him to his colleagues and make him a great teacher. It is his open-mindedness, his native honesty, his sympathetic understanding, his good judgment, his readiness to spend himself for others, his abounding good will and genial cooperation in every undertaking that have given him the place he holds in the affections of all who have had the good fortune to come under his influence. Teachers College has had and still has a goodly number of great teachers, men and women of intellectual power and professional strength, all of whom will gladly join with me in this tribute to one whom we delight to honor and for whom we wish another quarter of a century as full of the riches as the past twenty-five years have been.

February, 1926

JAMES E. RUSSELL

1940

No one needs a second introduction to Professor Thorndike because when one has once met him, or come under his influence, a bond has been established that brings a response in lasting friendship and increasing appreciation of his genius. He belies the adage that rating a man's career is never safe until he is under ground. But with him life grows more serene, judgment more tolerant, and insight more acute as the years advance. Now that retirement from active service approaches, it will bring not surcease from labor but freedom to work without constraint.

I am not competent to appraise his specific contributions to the science of human behavior, but I do know that his service to pedagogical procedure has revolutionized educational administration. At a time when teaching had no basis in assured fact, when the training of teachers was a matter of personal opinion, when the doctrine of formal discipline held both master and learner in slavish subjection, he led us into a new world where intellectual freedom and personal initiative paved the way to professional advancement. He made scientific method the hallmark of educational research and demonstrated its applications in pedagogical practice. Every member of the "Old Guard," that small group which laid the foundations of Teachers College, recognized his leadership and the few of us left take particular pleasure in joining with his former students in this present tribute to our dear colleague and their beloved master.

April, 1940 JAMES E. RUSSELL

Publications from 1898 to 1940 by E. L. Thorndike

INTRODUCTION

THE following Bibliography is a revision and extension of the one printed* in connection with the celebration of the twenty-fifth anniversary of Dr. Edward Lee Thorndike's appointment as professor in Teachers College. The titles are listed by the year of publication, as in the earlier volume, but the annotations which then appeared have been omitted from the present list.

This Bibliography has been prepared chiefly for the use of students. A serious endeavor has been made to make it complete, but it is probable that many reviews and articles of general rather than scientific interest have not been located. Contributions to foreign magazines not abstracted in the United States, and translations and paraphrases with or without permission, may have escaped detection. The compilers, who may be addressed at the Division of Psychology, Institute of Educational Research, Teachers College, will be grateful but not astonished when and if omitted titles are brought to their attention. Dr. Thorndike himself has been known to register surprise when some item of ancient date is proven to have come from his own pen, the fact of his characteristic handwriting being incontrovertible.

At Teachers College for forty years Dr. Thorndike's mind has been creative and fecund. The members of this sub-committee cherish the hope that the coming years of comparative freedom from fixed university tasks shall be the ones in which he will be enabled to round out the projects he finds of interest in a form that will satisfy his own standards of usefulness.

*The first Bibliography was printed in the February, 1926, issue of the TEACHERS COLLEGE RECORD.

1898

1. Animal Intelligence. *Psychological Review Monograph* 2. Pp. 109. Also *Columbia Contributions to Philosophy, Psychology, and Education* 4: 3: 1-109.
2. Some Experiments on Animal Intelligence. *Science* 7: 818-26 (June).
3. Note on Animal Intelligence. *Psychological Review* 5: 645-50 (November).
4. Review of (*a*) Hall: *Study of Fears.*
5. Review of (*b*) Hall and Allen: *The Psychology of Tickling, Laughing, and the Comic.*
6. Review of (*c*) Lindley: *A Study of Puzzles.*
7. Review of (*d*) Street: *A Study of Moral Education.*
8. Review of (*e*) Lindley and Partridge: *Some Mental Automatisms. Psychological Review* 5: 87-90 (February).
9. Review of Evans: *Evolution of Ethics and Animal Psychology. Psychological Review* 5: 229-30 (March).
10. Recent Changes in the Studies Required for the A.B. Degree in Colleges for Women. *Western Reserve University Bulletin* 2: 73-86.
11. What is a Psychical Fact? *Psychological Review* 5: 645-50 (November).

1899

12. An Experimental Study of the Associative Processes in Animals. Biological Lectures from Woods Hole Marine Laboratory. *Athenaeum Press*, pp. 57-91. Ginn and Co., Boston.
13. Do Animals Reason? *Popular Science Monthly* 55: 480-90 (August).
14. The Instinctive Reactions of Young Chicks. *Psychological Review* 6: 282-91 (May).
15. A Note on the Psychology of Fishes. *American Naturalist* 33: 923-26.
16. A Reply to "The Nature of Animal Intelligence and the Methods of Investigating It." *Psychological Review* 6: 412-20 (October).
17. Mental Fatigue. *Science* 9: 712-13 (May).
18. Sentimentality in Science Teaching. *Educational Review* 17: 57-64 (January).
19. Reading as a Means of Nature Study. *Education* 19: 368-71 (February).

1900

20. Reviews on Comparative Psychology. *Psychological Review* 7: 202-06 (March).
21. Judgments of Magnitude by Comparison with a Mental Standard (With Woodworth.) *Psychological Review* 7: 344-55 (July).
22. Mental Fatigue I. *Psychological Review* 7: 466-82 (September).
23. Mental Fatigue in School Children. *Psychological Review* 7: 547-79 (November).
24. Instinct. Woods Hole Lecture 5: pp. 57-68. Ginn and Co., Boston.
25. The Associative Processes in Animals. Woods Hole Lecture 6: pp. 69-91. Ginn and Co., Boston.
26. The Parent as a Factor in Mental Development. *Child Study Monthly* 5: 299-305 (January).
27. Some Data Concerning the Value of Latin as a Secondary School Subject. *Journal of Pedagogy* 13: 27-38 (June).

1901

28. The Human Nature Club. The Chautauqua Press, New York. Pp. 231.
29. The Human Nature Club. 2nd edition enlarged. Longmans, Green and Co., New York. Pp. iv + 235.
30. The Mental Life of the Monkeys. *Psychological Review Monograph.* Supplement No. 15. Pp. 57. Also *Columbia Contributions to Philosophy, Psychology, and Education* 9: 1.
31. The Intelligence of Monkeys. *Popular Science Monthly* 59: 273-79 (July).
32. The Evolution of Human Intellect. *Popular Science Monthly* 60: 58-65 (November).
33. Adaptation in Vision. *Science* 14: 221 (August).
34. Review of Titchener's *Experimental Psychology*. *School Review* 9: 484 (September).
35. The Failure of College Women to Marry. "Educational Problems." *New York Evening Post* (September).
36. Syllabi of Courses in Elementary and Applied Psychology. *Teachers College Record* 2: 4: 275-322 (September).
37. Notes on Child Study. *Columbia Contributions to Philosophy, Psychology, and Education* 8: 3 and 4: 1-157.

38. The Study of Children. *Teachers College Record* 2: 3: 165-274 (May).

39, 40, 41. The Influence of Improvement in One Mental Function Upon the Efficiency of Other Functions (With Woodworth.) *Psychological Review* 8. (1) Plan and Conclusions of Study, and Area Tests—247-61 (May). (2) The Estimation of Magnitudes—384-95 (July). (3) Functions Involving Attention, Observation, Discrimination—556-64 (November).

42. Review of Small's *Experimental Study of the Mental Processes of the Rat*—II. *Psychological Review* 8: 643-44 (November).

1902

43. Correlations Among Perceptive Processes and Associative Processes. *Psychological Review* 9: 374-82 (July).

44. Marriage Among Eminent Men. *Popular Science Monthly* 61: 328-29 (August).

45. Psychology in Secondary Schools. *School Review* 10: 114-23 (February).

46. The Experimental Method of Studying Animal Intelligence. *International Monthly* 5: 224-38 (February).

1903

47. Careers of Scholarly Men in America. *Century Magazine* 44: 153-55 (May).

48. Educational Psychology. Lemcke and Buechner, New York. Pp. vii + 173.

49. Heredity, Correlation and Sex Differences in School Abilities (Ed.). *Columbia Contributions to Philosophy, Psychology, and Education* 11: 2: 1-60.

50. Notes on Child Study. Second edition. *Columbia Contributions to Philosophy, Psychology, and Education* 8: 181. Macmillan Co., New York.

51. Notes on Psychology for Kindergarteners. *Teachers College Record* 4: 5: 45-76 (November).

52. Syllabus of a Course of Six Lectures on Fundamental Problems in Human Nature. *Teachers College Extension Syllabi Series* B: No. 8: 10.

53. The Decrease in the Size of American Families. *Popular Science Monthly* 63: 64-70 (May).

1904

54. An Introduction to the Theory of Mental and Social Measurements. The Science Press, New York. Pp. xii + 212.

55. Review of Hall's *Adolescence*. *Science* 20: 142-45 (July).
56. The Newest Psychology. *Educational Review* 28: 217-27 (October).
57. Review of Scott's *Theory of Advertising*. *Journal of Philosophy, Psychology, and Scientific Method* 1: 666 (November).
58. Review of Kirkpatrick's *Fundamentals of Child Study*.
59. Review of King's *The Psychology of Child Development*.
60. Review of Watson's *Animal Education*. *Educational Review* 27: 199-202 (February).

1905

61. The Elements of Psychology. A. G. Seiler, New York. Pp. xix + 371.
62. The Selective Influence of the College. *Educational Review* 30: 1-11 (June).
63. Measurement of Twins. *Journal of Philosophy, Psychology, and Scientific Methods* 2: 547-53 (September).
64. Measurements of Twins. *Archives of Philosophy, Psychology, and Scientific Methods* No. 1 (September). Also *Columbia Contributions to Philosophy and Psychology* 13:3. Science Press, New York. Pp. vi + 64.
65. The Quantitative Study of Education. *Forum* 36: 443-48 (January).
66. What Instruction in Educational Psychology Should Be Given in a Professional Course for Teachers? *Teachers College Record* 6: 20-41 (January).

1906

67. Principles of Teaching. A. G. Seiler, New York. Pp. xii + 293.
68. Sex in Education. *Bookman* 23: 211-14 (April).
69. The Opportunity of the High Schools. *Bookman* 24: 180-84 (October).
70. A Sociologist's Theory of Education. *Bookman* 24: 290-94 (November).
71. An Empirical Study of College Entrance Examinations. *Science* 23: 839-45 (June).
72. The Future of the College Entrance Examination Board. *Educational Review* 31: 470-83 (May).
73. Résumé of an address on Heredity. *American Physical Education Review* 11: 104-05 (June).
74. Review of Wood's *Mental and Moral Heredity in Royalty*. *Science* 23: 693-94 (May).

75. Review of Ward's *Applied Psychology*. *Science* 24: 299-301 (September).

1907

76. Elements of Psychology. Second edition. A. G. Seiler, New York. Pp. x + 351.
77. Empirical Studies in the Theory of Measurement. *Archives of Psychology* No. 3 (April). Also *Columbia Contributions to Philosophy and Psychology* 13:3. Science Press, New York. Pp. 45.
78. Accuracy from the Viewpoint of the Psychologist. *Education* 27: 458-66 (April).
79. A Neglected Aspect of the American High School. *Educational Review* 33: 245-55 (March).
80. On the Function of Visual Images. *Journal of Philosophy, Psychology, and Scientific Methods* 4: 12: 324-27 (June).
81. The Mental Antecedents of Voluntary Movements. *Journal of Philosophy, Psychology, and Scientific Method* 4: 2: 40-42 (January). Read before the American Psychological Association, December 29, 1906.
82. The Elimination of Pupils from School. *U. S. Bureau of Education Bulletin* No. 4, 1907. Whole No. 379. Department of the Interior: Bureau of Education. Government Printing Office, Washington. Pp. 63.
83. Introduction to the Statistical Tables. Report of the United States Commissioner of Education for the year ended June 30, 1907. Part II: 523-41.

1908

84. Memory for Paired Associates. *Psychological Review* 15: 122-38 (March).
85. The Effect of Practice in the Case of a Purely Intellectual Function. *American Journal of Psychology* 19: 374-84 (July).
86. A Pragmatic Substitute for Free Will. In *Essays Philosophical and Psychological in Honor of William James*, pp. 585-610. Longmans, Green and Co., New York.
87. Review of Ribot's *Essay on the Creative Imagination*. *Educational Review* 35: 198 (February).
88. Review of Major's *First Steps in Mental Growth*. *Educational Review* 36: 314 (October).

89. Review of Thompson's *Brain and Personality*. *Educational Review* 35: 307-308.

1909

90. Influence of the Number of Men Teachers upon the Enrollment of Boys in Public High Schools. *Educational Review* 37: 71-85 (January).
91. The Teaching Staff of Secondary Schools in the United States. *U. S. Bureau of Education Bulletin* No. 4. Whole No. 404. Pp. 60.
92. Darwin's Contribution to Psychology. *University of California Chronicle* 12: 1: 65-80.
93. A Note on the Specialization of Mental Functions with Varying Content. *Journal of Philosophy, Psychology, and Scientific Methods* 6: 239-40 (April).
94. The Relation of Accuracy in Sensory Discrimination to General Intelligence. *American Journal of Psychology* 20: 364-69 (July).
95. A Note on Accuracy of Discrimination of Weights and Lengths. *Psychological Review* 16: 340-46 (September).
96. Exercises in Arithmetic, Selected, Graded and Arranged to Meet the Requirements of the Hygiene of the Eye and Neuro-Muscular Apparatus. A. G. Seiler, New York. Ex. 1 through 5.
97. The Feminization of American Education. Vermont State Teachers Association, pp. 48-62 (October).

1910

98. The Contribution of Psychology to Education. *Journal of Educational Psychology* 1: 5-12 (January).
99, 100. Promotion, Retardation, and Elimination. *Clinical Psychology* 3: 232-42; 255-65 (January, February).
101. Collegiate Instruction. *Science* 31: 428-31 (March).
102. Repeaters in the Upper Grammar Grades. *Elementary School Teacher* 10: 409-14 (May).
103. The Relation Between Memory for Words and Memory for Numbers and the Relation Between Memory over Short and Memory over Long Intervals. *American Journal of Psychology* 21: 487-88 (July).
104. Practice in the Case of Addition. *American Journal of Psychology* 21: 483-86 (July).
105. Handwriting. *Teachers College Record* 11: 2: 1-81 (March).
106. William James. *Journal of Educational Psychology* 1: 473-74 (September).

107. Education A Notebooks. Teachers College, Columbia University, New York.

108. Educational Psychology. Second edition. Teachers College, Columbia University, New York.

109. Review of Ayres' *Laggards in Our Schools. Educational Review* 39: 199-203 (February).

1911

110. Animal Intelligence. Macmillan Co., New York. Pp. viii + 297.

111. Individuality. Houghton Mifflin Co., Boston. Pp. x + 56. (Riverside Educational Monograph.)

112. The Emotional Price of Peace. *American Association for International Conciliation* No. 45 (August). Pp. 11.

113. Mental Fatigue. *Journal of Educational Psychology* 2: 61-80 (February).

114. Testing the Results of the Teaching of Science. *School Science and Mathematics* 11: 315-20 (April).

115. G. Stanley Hall. *Scientific American* 104: 399 (April).

116. A Scale for Measuring the Merit of English Writing. *Science* 33: 935-38 (January). *Scientific American Supplement* 72: 158-59 (September).

117. A Scale for Merit in English Writing by Young People. *Journal of Educational Psychology* 2: 361-68 (September).

118. Psychology in Advertising. *Scientific American* 105: 250-51 (September).

119. Quantitative Investigations in Education: With Special Reference to Cooperation within This Association. *School Review Monthly* 1: 33-52.

120. Review of Whipple's *Manual of Mental and Physical Tests. American Journal of Psychology* 22: 2: 307-09 (April).

121. Review of Gilbreth's *Motion Study. American Economic Review* Series 4: 1: 581-82 (September).

122. Review of Gamble's *Study in Memorizing. Psychological Bulletin* 8: 7 (July).

1912

123. Education: A First Book. Macmillan Co., New York. Pp. ix + 292.

124. Professional Training for College and University Teachers. *Zeitschrift für Hochschulpädagogik* 3: 2-7 (January).

125. The Curve of Work. *Psychological Review* 19: 165-94 (May).
126. The Permanence of Interests and Their Relation to Abilities. *Popular Science Monthly* 81: 449-56 (November).
127. Handwriting. Teachers College, Columbia University, New York. Reprinted from *Teachers College Record* (March, 1910).
128. Introduction to Moll's *The Sexual Life of the Child*. Macmillan Co., New York. Pp. v-ix.
129. Review of Scott's *Increasing Human Efficiency in Business*. *American Economic Review* 2: 367-69 (June).
130. The Measurement of Educational Products. *School Review* 20: 289-99 (May).

1913

131. Introduction to the Theory of Mental and Social Measurement. Second edition, revised and enlarged. Teachers College, Columbia University, New York. Pp. xi + 277.
132. Educational Psychology. Vol. I: The Original Nature of Man. Teachers College, Columbia University, New York. Pp. xii + 327.
133. Educational Psychology. Vol. II: The Learning Process. Teachers College, Columbia University, New York. Pp. xi + 452.
134. Educational Administration. (With Strayer.) Macmillan, New York. Pp. xii + 391.
135, 136. Educational Diagnosis. *Science* 37: 133-42 (January); 258-59 (February).
137. Ideo-motor Action. *Psychological Review* 20: 91-106 (March).
138. Address at Teachers College Alumni Meeting. *Teachers College Bulletin* No. 15: 5-15 (March).
139. Tests for Speed and Accuracy in Arithmetic. *New York Teachers Monographs* 15: No. 2: 33-34 (June).
140. Improvement in a Practice Experiment under School Conditions. (With Donovan.) *American Journal of Psychology* 24: 426-28 (July).
141. Review of Loeb's *The Mechanistic Conception of Life*. *Psychological Bulletin* 10: 331 (August).
142. Eugenics with Special Reference to Intellect and Character. *Popular Science Monthly* 83: 125-38 (August).
143. The Measurement of Achievement in Drawing. *Teachers College Record* 14: 5: 345-82 (November).
144. Practice in the Case of Typewriting (With Hill and Rejall.) *Pedagogical Seminary* 20: 516-29 (December).

145. Theories of Mental Work and Fatigue. *School and Home Education* 33: 44-47 (October).

146. The Hygiene of Mental Work. *School and Home Education* 33: 84-87 (November).

147. Notes on the Significance and Use of the Hillegas Scale for Measuring the Quality of English Composition. *English Journal* 2: 551-61 (November).

148. A Comparison of the Trustworthiness of Estimates of Yearly Butter Fat Production. *Guernsey Breeders' Journal.* Pp. 6.

1914

149. Educational Psychology. Vol. III: Mental Work and Fatigue and Individual Differences and Their Causes. Teachers College, Columbia University, New York. Pp. x + 408.

150. Educational Psychology, Briefer Course. Teachers College, Columbia University, New York. Pp. xii + 442.

151. Review of Wood's *Influence of Monarchs. Journal of Philosophy, Psychology, and Scientific Methods* 11: 81-82 (January).

152. Some Results of Practice in Addition under School Conditions. (With Hahn and Donovan.) *Journal of Educational Psychology* 5: 65-84 (February).

153. An Experiment in Grading Problems in Algebra. *Mathematics Teacher* 6: 123-34 (March).

154. The Measurement of Ability in Reading. Preliminary Scales and Tests. *Teachers College Record* 15: 207-77 (September).

155. Means of Increasing Efficiency in Arithmetic. *Indiana University Bulletin,* XII: Proceedings of a Conference on Educational Measurements: 9-25 (September).

156. Tests of Silent and Oral Reading (Discussion). *Indiana University Bulletin,* XII: 37-51 (September).

157. Individual Differences and Their Causes. *Indiana University Bulletin,* XII: Proceedings of a Conference on Educational Measurements: 59-75 (September).

158. On the Relation Between Speed and Accuracy in Addition. *Journal of Educational Psychology* 5: 537 (October).

159. Fatigue in a Complex Function. *Psychological Review* 21: 402-407 (November).

160. Failure of Equalizing Opportunity to Reduce Individual Differences. *Science* 40: 753-55 (November).

161. Teachers' Estimates of the Quality of Specimens of Handwriting. 4 supplements. 3 record sheets. *Teachers College Record* 15: 279-91 (November).

162. Some Results of the First Year's Work of the New York State Commission on Ventilation. (With six others.) *American Journal of Public Health* 5: 85-118 (December).

163. Effect of Continuous Exercise and of Rest upon Difficult Mental Multiplication. *Journal of Educational Psychology* 5: 597-98 (December).

164. Measurements of Ability to Solve Arithmetical Problems. *Pedagogical Seminary* 21: 495-503 (December).

165. The Significance of the Binet Mental Ages. *Psychological Clinic* 8: 185-89 (December).

166. The Foundations of Educational Achievement. *Educational Review* 48: 487-97 (December).

167. Repetition Versus Recall in Memorizing Vocabularies. *Journal of Educational Psychology* 5: 596-97 (December).

168. Eugenics with Special Reference to Intellect and Character. Lecture IX, in *Eugenics: Twelve University Lectures*, pp. 319-42. Dodd Mead and Co., New York.

169. Professor Cattell's Relation to the Study of Individual Differences. In *The Psychological Researches of James McKeen Cattell. Columbia Contributions to Philosophy and Psychology* 22: 4: 92-101. Also *Archives of Psychology* No. 30 (April). Science Press, New York.

1915

170. Ideo-motor Action: A Reply to Professor Montague. *Journal of Philosophy, Psychology, and Scientific Methods* 12: 32-37 (January).

171. The Disciplinary Values of Studies: A Census of Opinions. *Education* 35: 278-86 (January).

172. The Relation Between Initial Ability and Improvement in a Substitution Test. *School and Society* 1: 429-31 (March).

173. The Form of the Curve of Practice in the Case of Addition. *American Journal of Psychology* 26: 247-50 (April).

174. Means of Measuring School Achievements in Handwriting. *Educational Administration and Supervision* 1: 300-305 (May).

175. Means of Measuring School Achievements in Spelling. *Educational Administration and Supervision* 1: 306-12 (May).

176. The Resemblance of Young Twins in Handwriting. *American Naturalist* 49: 377-79 (June).

177. The Intellectual Status of Children Who Are Public Charges. (With Stenquist and Trabue.) *Archives of Psychology* No. 33 (September). Also *Columbia Contributions to Philosophy and Psychology* 24: 2. Science Press. Pp. 52.

178. Review of Watson's *Behavior.* (With Herrick.) *Journal of Animal Behavior* 5: 462-70 (December).

179. An Improved Scale for Measuring Ability in Reading. *Teachers College Record* 16: 31-52 (November).

1916

180. An Improved Scale for Measuring Ability in Reading (concluded). *Teachers College Record* 17: 40-67 (January) (See 179 above).

181. The Technique of Combining Incomplete Judgments of the Relative Positions of *N* Facts Made by *N* Judges. *Journal of Philosophy, Psychology, and Scientific Methods* 12: 197-204 (April).

182. English Composition: 150 Specimens Arranged for Use in Psychological and Educational Experiments. Teachers College, Columbia University, New York. Pp. 127.

183. Notes on Practice, Improvability and the Curve of Work. *American Journal of Psychology* 27: 550-65 (October).

184. The Significance of the Binet-Simon Tests. *Psychological Clinic* 10: 121-23 (October).

185. Education for Initiative and Originality. *Teachers College Record* 17: 405-16 (November).

186. The Measurement of Achievement in Reading: Word Knowledge. *Teachers College Record* 17: 430-54 (November).

187. Tests of Aesthetic Appreciation. *Journal of Educational Psychology* 7: 509-22 (November).

188. Ventilation in Relation to Mental Work. (With McCall and Chapman.) *Teachers College Contributions to Education.* Teachers College, Columbia University, New York. Pp. iii + 83.

189, 190. The Effects of Outside Air and Recirculated Air upon Intellectual Achievement and Improvement. (With McCall and Ruger.) *School and Society* 3: 679-84 (May); 4: 260-64 (August).

1917

191. The Curve of Work and the Curve of Satisfyingness. *Journal of Applied Psychology* 1: 265-67 (September).

192. Early Interests: Their Permanence and Relation to Abilities. *School and Society* 5: 178-79 (February).

193. The Psychology of Thinking in the Case of Reading. *Psychological Review* 24: 220-34 (May).

194. Reading and Reasoning: A Study of Mistakes in Paragraph Reading. *Journal of Educational Psychology* 8: 323-32 (June).

195. The Understanding of Sentences: A Study of Errors in Reading. *Elementary School Journal* 18: 98-114 (October).

196. Magnitude and Rate of Alleged Changes at Adolescence. *Educational Review* 54: 140-47 (September).

197. Effect of Humidification of a School Room upon Intellectual Progress of Pupils. (With Kruse.) *School and Society* 5: 657-60 (June). Also in *Psychological Review* 24: 147-53 (June).

198. Individual Differences in Judgments of the Beauty of Simple Forms. *Psychological Review* 24: 147-53 (March).

199. On the Function of Visual Imagery and Its Measurement from Individual Reports. *Journal of Philosophy, Psychology, and Scientific Method* 14: 381-84 (July).

200, 201, 202. The Thorndike Arithmetics. Books 1, 2, 3. Rand McNally and Co., New York. Book 1, pp. xvi + 263; Book 2, pp. xvi + 286; Book 3, pp. xvi + 330.

1918

203. Fundamental Theorems in Judging Men. *Journal of Applied Psychology* 2: 67-76 (March). Also *Teachers College Record* 19: 3: 278-88 (May).

204. Individual Differences. *Psychological Bulletin* 15: 148-59 (May).

205. The Nature, Purposes, and General Methods of Measurement of Educational Products. *National Society for the Study of Education Yearbook* 17: 2: 16-24.

206. Plan for Rating and Classification of Soldiers in the Students' Army Training Corps. War Department, Washington, D. C. Commission on Education and Special Training (November). Pp. 81.

1919

207. Directions for Thorndike Reading Scale, Alpha 2. *Teachers College Bulletin.* 11th series, No. 6 (November).

208. Education for Initiative and Originality. *Teachers College Bulletin.* 11th series, No. 4 (October). Reprint of 185.

209. Psychological Research for Aviators. *Science* 49: 215-16 (February).

210. Reading Scales: The Understanding of Sentences. Monograph and Set of Scales. Teachers College, Columbia University, New York.

211. Reading Scales: Visual Vocabulary. Monograph and Set of Scales. Teachers College, Columbia University, New York.

212. Scientific Personnel Work in the Army. *Science* 49: 53-61 (January).

213. The Selection of Military Aviators: Mental and Moral Qualities. *U. S. Air Service* 1: 14-17 (June).

214. The Selection of Military Aviators: Physical and Psycho-Physical Qualities. *U. S. Air Service* 2: 28-32 (August).

215. A Standardized Group Examination of Intelligence Independent of Language. *Journal of Applied Psychology* 3: 13-32 (March).

216. Tests of Intelligence; Reliability, Significance, Susceptibility to Special Training and Adaptation to the General Nature of the Task. *School and Society* 9: 189-95 (February).

217. Thorndike Extension to the Hillegas English Composition Scale. Teachers College, Columbia University, New York.

218. Intelligence Examination for High School Graduates. Instructions for Giving, Scoring, and Interpreting Scores. Series 1919-1924. Pp. 12. Teachers College, Columbia University, New York.

1920

219. A Constant Error in Psychological Ratings. *Journal of Applied Psychology* 4: 25-29 (March).

220. Correction Formulae for Addition Tests. (With Courtis.) *Teachers College Record* 21: 1-24 (January).

221. Equality in Difficulty of Alternative Intelligence Examinations. *Journal of Applied Psychology* 4: 283-88 (December).

222. How Fast Can You Read? How Well Can You Read? *People's Magazine* 5: 33: 43-47 (December).

223. Intelligence and Its Uses. *Harper's Magazine* 140: 227-35 (January).

224. Intelligence Examinations for College Entrance. *Journal of Educational Research* 1: 329-37 (May).

225. Psychological and Educational Tests. *American Physical Education Review* 25: 228-33 (June).

226. Psychological Notes on the Motives for Thrift. *Annals of the American Academy of Political and Social Sciences* 87: 212-18 (January).

227. The New Psychological Tests: Are They a Substitute for Content Examinations? *Educational Review* 59: 97-104 (February).

228. The Psychology of the Half-Educated Man. *Harper's Magazine* 140: 666-70 (April).

229. The Reliability and Significance of Tests of Intelligence. *Journal of Educational Psychology* 11: 284-87 (May).

230. The Standardization of Instruments of Instruction. *Bulletin of the Extension Division, Indiana University* 6: 14-24 (September).

231. The Task of the Elementary School. *Bulletin of the Extension Division, Indiana University* 6: 4-13 (September).

232. Thorndike Visual Vocabulary Scales: Directions for Their Use. *Teachers College Bulletin* 17 (February).

1921

233. The Teacher's Word Book. Teachers College, Columbia University, New York. Pp. vi + 134.

234. Thorndike-McCall Reading Scales for Grades 2-12. (With McCall.) Teachers College, Columbia University, New York.

235. The Constitution of Arithmetical Abilities. *Journal of Educational Psychology* 12: 14-24 (January).

236. *Review of Letters of William James. Science* 53: 165-67 (February).

237. On the Organization of Intellect. *Psychological Review* 28: 141-51 (March).

238. Intelligence and Its Measurement. *Journal of Educational Psychology* 12: 124-27 (March).

239. The Psychology of Drill in Arithmetic: The Amount of Practice. *Journal of Educational Psychology* 12: 183-94 (April).

240. Word Knowledge in the Elementary School. *Teachers College Record* 22: 334-70 (September).

241. Measurement in Education. *Teachers College Record* 22: 371-79 (November).

242. New Methods in Arithmetic. Rand McNally and Co., New York. Pp. viii + 260.

243. The Correlation Between Interests and Abilities in College Courses. *Psychological Review* 28: 374-76 (September).

244. On the New Plan of Admitting Students at Columbia University. *Journal of Educational Research* 4: 95-101 (September).

1922

245. The Effect of Changed Data upon Reasoning. *Journal of Experimental Psychology* 5: 33-38 (February).

246. Practice Effects in Intelligence Tests. *Journal of Experimental Psychology* 5: 101-07 (February).

247. The Abilities Involved in Algebraic Computation and in Problem Solving. *School and Society* 15: 191-93 (February).

248. On Finding Equivalent Scores in Tests of Intelligence. *Journal of Applied Psychology* 6: 29-33 (March).

249. Instruments for Measuring the Disciplinary Value of Studies. *Journal of Educational Research* 5: 269-79 (April).

250. The Psychology of Labor. *Harper's Magazine* 144: 799-806 (May).

251. Changes in the Quality of the Pupils Entering High School. *School Review* 30: 355-59 (May).

252. The Uses of Algebra in Study and Reading. (With Woodyard.) *School Science and Mathematics* 22: 405-15 and 514-22 (May and June).

253. The Permanence of School Learning. *School and Society* 15: 625-27 (June).

254. An Instrument for Measuring Certain Aspects of Intelligence in Relation to Growth, Practice, Fatigue, and Other Influences. *Journal of Experimental Psychology* 5: 197-202 (June).

255. The Occupations of High School Graduates and Non-Graduates. (With Symonds.) *School Review* 30: 443-51 (June).

256. Measurement in Education. *National Society for the Study of Education Yearbook* 21: 1-9.

257. An Experiment in Learning an Abstract Subject. (With Upton.) *Journal of Educational Psychology* 13: 321-30 (September).

258. Completion Tests in Physics. *School Science and Mathematics* 22: 637-47 (October).

259. The Psychology of Arithmetic. Macmillan Co., New York. Pp. xvi + 314.

260, 261. The Nature of Algebraic Abilities. (January, February).

262. The Psychology of the Equation. (March).

263, 264. The Psychology of Problem Solving. (April, May).

265. The Strength of Mental Connections Formed in Algebra. (October).

266. The Constitution of Algebraic Abilities. (November). *Mathematics Teacher* 15: 6-15, 79-90, 127-136, 212-227, 253-264, 317-331, 405-15.

267. The Thorndike Test of Word Knowledge. Forms A, B, C, D. Bureau of Publications, Teachers College, Columbia University, New York. Forms E, F, G, H, printed privately.

268. Psychologie der Erziehung (Trans. by O. Bobertag.) G. Fisher, Jena. Pp. xi + 351.

1923

269. The Psychology of Algebra. Macmillan Co., New York. Pp. viii + 483.

270. The Influence of First Year Latin upon Range in English Vocabulary. *School and Society* 17: 82-84 (January).

271. The Influence of First Year Latin upon Ability to Read English. *School and Society* 17: 165-68 (February).

272. The Construction and Interpretation of Correlation Tables. *Journal of Educational Research* 7: 199-212 (March).

273. The Diversity of High School Students' Programs. (With Robinson.) *Teachers College Record* 24: 111-21 (March).

274. Educational Psychology. *Science* 57: 429-31 (April).

275. The Variability of an Individual in Repetitions of the Same Task. *Journal of Experimental Psychology* 6: 161-67 (April).

276. The Interests of Teachers in Studies during Their High School Course. *School and Society* 17: 419-20 (April).

277. Address in Honor of Dean Russell. *Teachers College Record* 24: 302-07 (May).

278. The Effect of First Year Latin upon Knowledge of English Words of Latin Derivation. *School and Society* 18: 260-70 (September).

279. The Intelligence Scores of Colored Pupils in High Schools. *School and Society* 18: 569-70 (November).

280. Difficulty, Reliability, and Grade Achievements in a Test of English Vocabulary. *Teachers College Record* 24: 438-45 (November).

281. The Gains Made in Ability in English by Pupils Who Study Latin and by Pupils Who Do Not. *School and Society* 18: 690 (December).

282. A Scale for General Merit of Children's Drawings. Revised edition. *Teachers College Bulletin* (December). See 143.

283. On the Improvement in Intelligence Scores from Fourteen to Eighteen. *Journal of Educational Psychology* 14: 513-16 (December).

1924

284, 285. Mental Discipline in High School Studies. *Journal of Educational Psychology* 15: 1-22 (January); 15: 83-98 (February).

286. The Disciplinary Value of Studies in the Opinion of Students. *Teachers College Record* 25: 134-43 (March).

287. The Measurement of Intelligence: The Present Status. *Psychological Review* 31: 219-52 (May).

288. The Influence of the Chance Imperfections of Measures. *Journal of Experimental Psychology* 7: 225-32 (June).

289. The Right Use of Leisure. *Journal of the National Institute of Social Science* 9: 19-26 (October).

290. The Selection of Tasks of Equal Difficulty by a Consensus of Opinion. (With Bregman and Cobb.) *Journal of Educational Research* 9: 133-39 (February).

291. On the Form of Distribution of Intellect in the Ninth Grade. (With Bregman.) *Journal of Educational Research* 10: 271-78 (November).

292. The Vocabularies of School Pupils. New York Society for the Experimental Study of Education. *Contributions to Education* 1: 69-76. World Book Co., Yonkers, New York.

293. A Scale for General Merit of Children's Drawings. (Revision. See 143 and 282.) Teachers College, Columbia University, New York.

294. Intelligence Examination for High School Graduates. Instructions for Giving, Scoring, and Interpreting Scores. Series 1925-1930. Pp. 11. Teachers College, Columbia University, New York.

295. Standard Tests and Their Use. *Teachers College Record* 26: 93-94 (October).

296, 297, 298. Arithmetic. Book One, Book Two, Book Three. Rand McNally and Co., Chicago. Book One, xvi + 245 pp. Book Two xvi + 282 pp. Book Three, xvi + 330 pp. Each book also issued in two parts.

1925

299. Improvement of Mental Measurements. *Journal of Educational Research* 11: 1-11 (January).

300. The Nature of Intellect. *Educational Record* 6: 3-12 (January).

301. On the Provision of Alternative Forms of Examinations Equal in Difficulty. *Journal of Applied Psychology* 9: 1-4 (March).

302. Review of Köhler's *The Mentality of Apes. Nation* 120: 430 (April 15).

303. The Learning Process. A review of Koffka's *The Growth of the Mind. Nation* 120: 553-54 (May).

304. I.E.R. Intelligence Scale CAVD Levels A to Q. Printed in 5 parts. Teachers College, Columbia University, New York.

305. Inventory of Intelligence Test Items. In mimeographed form for research workers. Teachers College, Columbia University, New York.

1926

306. The Measurement of Intelligence. (With Bregman, Cobb, Woodyard, et al.) Teachers College, Columbia University, New York. Pp. xxvi + 616.

307. Principles of Teaching Based on Psychology. (Trans. by E. V. Gerié.) Rabotnik Prosveschenia, Moscow. Pp. v + 235.

308. On the Improvement in Intelligence Scores from Thirteen to Nineteen. *Journal of Educational Psychology* 17: 73-76 (February).

309. Sex Differences in Status and Gain in Intelligence Scores from Thirteen to Eighteen. *Pedagogical Seminary* 33: 167-81 (June).

310. On the Variability of Boys and Girls from Thirteen to Eighteen. *Pedagogical Seminary* 33: 181-84 (June).

311. Relation of Earning Power to Age in Professional Workers under Conditions of Nearly Free Competition. (With Woodyard.) *Journal of American Statistical Association* 21: 293-309 (September).

1927

312. A Fundamental Theorem in Modifiability. *Proceedings of the National Academy of Sciences* 13: 15-18 (January).

313. The Influence of Primacy. *Journal of Experimental Psychology* 10: 18-29 (February).

314. An Inventory of English Construction Scales with Measures of Their Importance. (With Evans, Kennon, and Newcomb.) *Teachers College Record* 28: 580-610 (February).

315. The Effect of Violent Price-Fluctuations upon the Salaries of Clergymen. (With Woodyard.) *Journal of American Statistical Association* 22: 66-74 (March).

316. The Refractory Period in Associative Processes. *Psychological Review* 34: 234-36 (May).

317. A Second Study of Mental Discipline in High School Studies. (With Brolyer and Woodyard.) *Journal of Educational Psychology* 18: 377-404 (September).

318. Education for Initiative and Originality. *Teachers College Record* 29: 89-100 (November). Reprint of 185 and 208.

319. The Law of Effect. *American Journal of Psychology* 39: 212-22 (December).

320. Progress in Learning an Auxiliary Language. (With Kennon.) International Auxiliary Language Association of the United States, Inc., New York. Pp. 38.

1928

321. Adult Learning (With Bregman, Tilton, and Woodyard.) Studies in Adult Education. Macmillan, New York. Pp. x + 335.

322. The Teachable Age. *Survey* 60: 35-37 (April).

323. Learning from Six to Sixty. *Survey* 60: 118-20 (April).

324. The Psychology of the School Dictionary. Fifteenth Annual Conference on Educational Measurements. *Bulletins* 13-19, *The School of Education, Indiana University*, 24-31 (April).

325. The Testing Movement in the Light of Recent Research. *Journal of Educational Research* 17: 345-49 (May).

326. Curriculum Research. *School and Society* 18: 569-76 (November). Also in *Proceedings of Sixty-fourth Convocation of the University of the State of New York* 28: 56-66.

327. The Resemblance of Siblings in Intelligence. *Twenty-seventh Yearbook of the National Society for the Study of Education*, Part I, 41-53.

1929

328. Elementary Principles of Education. (With A. I. Gates.) Macmillan Co., New York. Pp. x + 335.

329. Investigating the Curriculum. The Psychologists Dissect the Course of Study. *Journal of Adult Education* 1: 41-48 (February).

330. Growth in Spelling; Grades 2-4, 5-8 (With Wohlfarth.) (Two books). World Book Co., Yonkers, New York; Book 1, 120 pp.; Book 2, 153 pp.

331. Influence of the Repetition of a Series upon the Omission of its Intermediate Terms. (With Freiburg and Dallenbach.) *American Journal of Psychology* 41: 637-639 (October).

332. Granville Stanley Hall, 1846-1924. *National Academy of Science, Biographical Memoirs*, 7: 133-80.

333. Principles of Teaching, based on Psychology. (Trans. by E. V. Gerié.) (Second and third eds.) Rabotnik Prosveschenia, Moscow. Pp. 234, 235.

334. Need of Fundamental Analysis of Methods of Teaching. *Elementary School Journal* 30: 189-91 (November).

335. Intelligence Tests. *Encyclopædia Britannica* (14th Ed.) 12: 460-61.

1930

336. Right Use of Leisure. *Journal of Adult Education* 2: 42-46 (January).

337. The Use of Leisure. *Playground* 23: 713-14 (March).

338. A Study of Ventilation and Respiratory Illness in Syracuse Schools: Rate of Air Flow and Room Temperature in Relation to the Health of School Children. *American Journal of Hygiene* 12 (1): 215-237 (July).

339. Psychologist Predicts Great Economy in Education. *Buffalo Evening News* (October).

1931

340. A Teacher's Word Book of the Twenty Thousand Words Found Most Frequently and Widely in General Reading for Children and Young People. Teachers College, Columbia University. Pp. 189.

341. On the Learning of Rules in the Study of a Foreign Language. *German Quarterly* 4: 89-95 (May).

342. Human Learning. Century Co., New York. Pp. 206.

343. The Value of Research in Education. The Results of the Work of the Division of Psychology, Institute of Educational Psychology. *Teachers College Record* 33: 96-112 (November).

344. Intelligence Examination for High School Graduates. Instructions for Giving, Scoring, and Interpreting Scores. Series 1931-1936. Teachers College, Columbia University, New York. Pp. 8.

345. Der Lernprozess (Trans. by Adolf Bruckner). *Vjsch. f. Jugndk.* 1: 161-69.

1932

346. Fundamentals of Learning. (With staff of the Division of Psychology, Institute of Educational Research.) Bureau of Publications, Teachers College, Columbia University, New York. Pp. xvii + 638.

347. Psychology and Engineering. *Mechanical Engineering* 54: 30-34 (January).

348. Intelligence of Animals and Men. Psychology Series Lecture 20 (March). University of Chicago Press, Chicago.

349. Distribution of Education. *School Review* 40: 335-45 (May).

350. Effects of Punishment and of Reward (radio address). Psychology Series Lecture No. 26. University of Chicago Press, Chicago. Pp. 6.

351. Reward and Punishment in Animal Learning. *Comparative Psychology Monographs* 8: No. 4. Pp. 65.

352. The Significance of Responses in the Free Association Test. *Journal of Applied Psychology* 16: 247-53 (June).

1933

353. The Influence of Irrelevant Rewards. *Journal of Educational Psychology* 24: 1-5 (January).

354. A Proof of the Law of Effect. *Science* 77: 173-75 (February).

355. The Comparative Strengthening of a Connection by one or more Occurrences of it in Cases where the Connection was Punished and was neither Punished nor Rewarded. (With Lorge.) *Journal of Experimental Psychology* 16: 374-82 (June).

356. An Experimental Study of Rewards. *Teachers College Contributions to Education*, No. 580. Pp. 72.

357. The "Spread" or "Scatter" of the Influence from a Reward, in Relation to Gestalt Doctrines. *Science* 77: 368 (April).

358. The Influence of Use or Frequency of Occurrence upon the Strength of Mental Connections. *Proceedings of the National Academy of Science* 19: 734-45 (July).

359. The Influence of Increase and Decrease of the Amount of Reward upon the Rate of Learning. (With Forlano.) *Journal of Educational Psychology* 24: 401-11 (September).

360. A Theory of the Action of the After-Effects of a Connection Upon It. *Psychological Review* 40: 434-39 (September). Also in *Psychological Bulletin* 30: 672-73. Also in *Sovetsk Psikhonevrol* 1: 5-9.

361. The Prediction of Success in Vocational Life. *Occupations* 12: 21-25 (December).

362. Language Learning. (With Kennon.) Summary of a Report to the International Language Association in the United States. (Published as excerpted by Eaton.) Teachers College, Columbia University, New York. Pp. vii + 59.

1934

363. How We Learn. *Journal of Adult Education* 6: 47-51 (January).

364. Prediction of Vocational Success (With Bregman, Lorge, Metcalfe, Robinson, and Woodyard.) Commonwealth Press, New York. Pp. xxiv + 284.

365. Unity or Purity in Traits and Tests. *Occupations* 12: 57-59 (April).

366. Learning Without Awareness of What is Being Learned or Intent to

Learn It (With Rock.) *Journal of Experimental Psychology* 17: 1-19 (February) and *Journal of Experimental Psychology* 18: 388-89 (June, 1935).

367. The Influence of the Relative Frequency of Successes and Frustrations upon Intellectual Achievement (With Woodyard.) *Journal of Educational Psychology* 25: 241-50 (April).

368. The Influence of Irrelevant Continuing Discomfort upon Learning. (With Staff of the Division of Psychology, Institute of Educational Research, Teachers College.) *Journal of Genetic Psychology and Pedagogical Seminary* 44: 444-48 (June).

369. The Spread of the Influence of Reward to Connections Irrelevant to the Learner's Purposes. (With Staff of the Division of Psychology, Institute of Educational Research.) *Journal of Genetic Psychology and Pedagogical Seminary* 44: 428-36 (June).

370. The Influence of the Repetition of a Situation. *American Journal of Psychology* 46: 420-28 (July).

371. "Why Study Animal Psychology?" in *Comparative Psychology*, F. A. Moss (Ed.). Prentice-Hall, New York. Pp. 7.

372. Primitive Forms of Belief and Knowledge. *Psychological Review* 41: 403-11 (September).

373. Experiments in Euphony. *Psychological Bulletin* 31: 679-80 (October).

374. Improving the Ability to Read. *Teachers College Record* Part I, 36: 1-19 (October); Part II, 123-44 (November); Part III, 229-41 (December).

375. Word Knowledge in the Grades. *Nation's Schools* 14: 19-20 (December).

1935

376. The Thorndike Library (Edited to Fit the Interests and Abilities of Young Readers.) Series I and II. Appleton-Century, New York. Pp. viii + 224.

377. Rebounds from the Target: More About "The Prediction of Vocational Success." *Occupations* 13: 329-33 (January).

378. Adult Interests. (With staff of the Division of Psychology, Institute of Educational Research.) (Studies in Adult Education.) Macmillan Co., New York. Pp. ix + 265.

379. The Direct Action of Rewards Upon Mental Connections and Their Indirect Action Via the Stimulation of Inner Equivalents of the Connections. *Journal of Experimental Psychology* 18: 91-96 (February).

380. Paradox of Science. *Proceedings of the American Philosophical Society* 75: 287-94.

381. The Influence of Delay in the After-Effect of a Connection. (With Lorge.) *Journal of Experimental Psychology* 18: 187-94 (April).

382. Measurements of the Influence of Recency. *American Journal of Psychology* 47: 294-300 (April).

383. The Vocabularies of Juvenile Books. *Library Quarterly* 5: 151-63 (April).

384. Workers' Satisfaction: Likes and Dislikes of Young People for Their Jobs. *Occupations* 13: 704-706 (May).

385. Earned Opportunities. *Journal of Adult Education* 7: 260-62 (June).

386. The Psychology of Wants, Interests, and Attitudes. (With Staff of the Division of Psychology, Institute of Educational Research, Teachers College.) (Century Psychology Series.) Appleton-Century, New York. Pp. x + 301.

387. Four New Forms of the I.E.R. Intelligence Scale for Use on the College or Higher Levels. *School and Society* 42: 271-72 (August).

388. The Interests of Adults. I. The Permanence of Interests. II. The Interrelation of Adult Interests. *Journal of Educational Psychology* 26: 401-10; 497-507 (September, October).

389. Thorndike-Century Junior Dictionary. Scott, Foresman and Company, Chicago. Pp. x + 970.

390. In Defense of Facts. *Journal of Adult Education* 7: 381-82 (October).

391. Influence of Relevance and Belonging. (With Lorge.) *Journal of Experimental Psychology* 18: 574-84 (October).

1936

392. Science and Values. *Science* 83: 1-8 (January).

393. The Goal of Social Effort. *Educational Record* 17: 153-68 (April). Also in condensed form *Journal of American Association of University Women* 29: 199-206 (June).

394. The Value of Reported Likes and Dislikes for Various Experiences and Activities as Indications of Personal Traits. *Journal of Applied Psychology* 20: 285-313 (June).

395. Interim Report on Vocabulary Selection for the Teaching of English as a Foreign Language. (With R. H. Fife, L. Faucett, H. Palmer, M. West.) P. S. King & Son, Ltd., London. Pp. vii + 506.

396. Review of Gray and Leary's *What Makes a Book Readable. Elementary School Journal* 36: 470-72 (February).

397. Psychology and the Profit Motive. *Harper's Magazine* 173: 431-37 (September).

398. Psychology of the Speaker-Hearer Relation. *Psychological Bulletin* 33: 758-59 (October).

399. Edward Lee Thorndike, in *A History of Psychology in Autobiography* (Edited by Carl Murchison.) Vol. III: 263-70. Clark University Press, Worcester, Mass.

400. The Relation Between Intellect and Morality in Rulers. *American Journal of Sociology* 42: 321-34, (November) and 559-60 (January, 1937).

401, 402, 403. Vocabulary of Books for Children in Grades 3 to 8. *Teachers College Record* 38: Part I, 196-205 (December); Part II, 316-23 (January, 1937); Part III, 416-29 (February, 1937).

404. Function of Language. *English Literary and Educational Review for Continental Readers* 7: 145-47 (Winter, 1936-1937).

1937

405. Trains of Thought as Symptoms of Interests and Attitudes: An Exploratory Investigation. *Proceedings of the American Philosophical Society* 77: 439-45 (March).

406. Salaries of Executives. (With Beckwith.) *Personality Journal* 15: 312-20 (March).

407. Vocabulary of the Encyclopedia Britannica (1910 Edition). (With Lorge.) *Teachers College Record* 38: 485-90 (March).

408. Ignorance and Prejudice Concerning Economics and Business. (With Lorge.) *School and Society* 45: 589-92 (April).

409. On Correlations Between Measurements Which Are not Normally Distributed. *Journal of Educational Psychology* 28: 367-70 (May).

410. How We Spend Our Time and What We Spend It For. *Scientific Monthly* 44: 464-69 (May).

411. Teaching of Controversial Subjects. (Inglis Lectures.) Harvard University Press, Cambridge. Pp. 45.

412. Individual Differences in American Cities: Their Nature and Causation. (With Woodyard.) *American Journal of Sociology* 43: 191-224 (September).

413. What Do We Spend Our Money For? *Scientific Monthly* 45: 226-32 (September).

414. Variations Among Cities in Per Capita Income. *Journal of the American Statistical Association* 32: 471-79 (September).

415. A Note on Assimilation and Interference. *American Journal of Psychology* 49: 671-76 (October).

416. Trains of Thought. *Proceedings of American Philosophical Society* 77, No. 3, 417-38.

417. Valuations of Certain Pains, Deprivations and Frustrations. *Journal of Genetic Psychology and Pedagogical Seminary* 51: 227-39 (December).

418. On the Number of Words of Any Given Frequency of Use. *Psychological Record* 1: 399-406 (November).

1938

419. Heredity and Environment. *Journal of Educational Psychology* 29: 161-66 (March).

420. Business Men and the Community. *Greenwich Time* (Connecticut) (April 14).

421. Studies in the Psychology of Language. *Archives of Psychology*, Columbia University, New York. No. 231 (September). Pp. 67.

422. Individual Differences in Valuation. *Journal of Abnormal and Social Psychology* 33: 71-85 (January).

423. Part III of Symposium on the Law of Effect. *Psychological Review* 45: 204-205 (May).

424. Great Abilities: Their Frequency, Causation, Discovery, and Utilization. *Scientific Monthly* 47: 59-72 (July).

425. The Influence of Disparity of Incomes on Welfare. *American Journal of Sociology* 44: 25-35 (July).

426. Facts vs. Opinion: An Empirical Study of 117 Cities. *Public Opinion Quarterly* 2: 85-90 (January).

427. The Salaries of Men of Science Employed in Industry. *Science* 88: 327 (October).

428. L'organisation d'un individu. *Biotypologie*, Tome VI, No. 4: 251-58 (December).

1939

429. On the Fallacy of Imputing the Correlations Found for Groups to the Individuals or Smaller Groups Composing Them. *American Journal of Psychology* 52: 122-24 (January).

430. Your City. Harcourt Brace & Co., New York. Pp. 204.

431. Euphony and Cacophony of Words and Sounds. Pyrsos Press, Athens. Pp. 13.

432. Influence of the Personnel and Educational Facilities of a City in 1900 Upon Its Per Capita Income in 1930. *School and Society* 49: 672-73 (May).

433. How May We Improve the Selection, Training, and Life Work of Leaders? *Teachers College Record* 40: 593-605 (April).

434. Familial Resemblances and Composites of Desirable Traits. *Journal of Heredity* 30: 391-92 (September).

435. Education as Cause and as Symptom. (Kappa Delta Pi Lecture Series.) Macmillan Co., New York. Pp. 92.

436. Conference on Examinations: International Examination Inquiry 1938 (Ed. Paul Monroe.) Teachers College, Columbia University, New York. Pp. 240-52.

437. American Cities and States: Variation and Correlation in Institutions, Activities, and the Personal Qualities of the Residents. *Annals of the New York Academy of Science* 39, Art. 4, pp. 213-98.

1940*

438. Human Nature and the Social Order. Macmillan Co., New York. Pp. xx + 1019.

439. 144 Smaller Cities. (In Press.) Harcourt Brace & Co., New York.

440. Thorndike-Century Senior Dictionary. Scott, Foresman and Company, Chicago. (In press.)

441. The Value of Word Counts. *Elementary English Review* 17: 60-62, 67 (February).

*Up to May 1.

The Nature and Measurement of the Intellect

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A CRITICAL discussion of Edward L. Thorndike's work on the nature of intelligence and the testing of intellectual products will lay stress on his insistence on *quantitative* experiment; on the very great amount of actual experimenting he has done; on his common-sense determination to avoid fanciful hypotheses and overelaborate mathematics; and on his remarkable influence on the making and scaling of tests of intelligence. It will have to consider the rights and wrongs of the apparent conflict between Thorndike's early statement that "the mind is a host of highly particularized and independent faculties," and the Spearman view that intellect contains one dominant general factor *g*, with its later developments in the shape of factor analysis. It will have to ask how far Thorndike's "quantity hypothesis" of 1925 is consistent with his earlier views, or whether, as his opponent claimed, he had come round to a very Spearmanlike view himself. It will have to discuss Thorndike's criteria of what intellect is; his analysis of its measurement into altitude and width (forming together area) and speed; his attempt at the formation of an absolute scale with commensurable units and an absolute zero (where comparison with Thurstone is inevitable); and the tremendous impetus he gave to all that class of work in intelligence testing indicated by the phrase "item selection."

The difficulty of defining intelligence (or intellect, as Thorndike prefers to say) is recognized on all hands, and to the solution of this difficulty Thorndike brings his usual combination of common sense and what I may, for want of a better term, call his stereoscopy—by which I mean that neither here nor in any of his work is he content with a single point of view. Always, recognizing the complexity of psycho-

logical entities, he looks at them from many sides, and the point he is aiming at only becomes clear as the lines from different directions converge on a focus. Intelligence is what enables us to predict natural events truly. It grows with age, though it is not the only quality to do that. It enables man to learn, and to face and to originate novel circumstances. It is largely, though not exclusively, concerned with relational thinking. It is that in which Plato or Aristotle differed most from Athenian idiots and imbeciles of the fourth century before Christ. It is really, in a scientific sense, an inventory—an inventory of tasks which can be performed or problems which can be understood, meaning tasks or problems which are concerned with truth, with rational thinking, with things which interested Plato, with things which older children can do better than younger children. That, and a good deal more, is Thorndike's "definition" of intelligence. And, for myself, I understand pretty well when he has finished what it is he was talking about—which, after all, is the main thing, is it not? It is easy to poke fun with one critic at the inaccessible Athenian idiot, say that such and such a phrase begs the question, or make other criticisms of this or that single sentence. But the whole, scattered throughout Thorndike's writings, represents as good an account as I know anywhere of what man means when he uses the term "intelligence."

I. E. R. INTELLIGENCE SCALE CAVD

When Thorndike comes to experiment on intellect, he makes his definition workable by actually giving an inventory of the sort of tasks he means, thus bringing into existence his "intellect CAVD" where C means tasks of "Completion," after Ebbinghaus; A means Arithmetical tasks; V means knowledge of Vocabulary; and D means understanding Directions or connected Discourse. This conglomerate is, as he says, entirely arbitrary. Others may widen or alter the inventory, including perhaps information items, or opposites, or what not. But for CAVD he claims that as a whole it correlates excellently with what the world calls intelligence, including educational opportunity within that term, and making no attempt to measure original ability *in vacuo*. Ability in CAVD appears to correspond to some "unified, coherent, fundamental fact in the world."

AN ABSOLUTE SCALE OF INTELLECT

His CAVD tests, described in *The Measurement of Intelligence*,[1] written in 1925, consist, as is well known, of seventeen composite tests A to Q, each composed of forty items (ten completion, ten arithmetical, ten vocabulary, and ten "discourse" questions), of about equal difficulty in any one composite. Each such composite correlates almost perfectly (when allowance is made for attenuation, that is, for the inevitable unreliability of all such measurements) with a measurement made by them all together. For these seventeen composites Thorndike gives measures of their degree of difficulty (or "altitude" of intelligence needed to succeed in twenty of the forty tasks) *in equal units, measured from an absolute zero,* ranging from difficulty 23 for composite A to difficulty 43 for composite Q. Composite A, in more familiar terms, is about of the difficulty which a child of three can tackle, while composite Q is difficult enough to stretch the intelligence of the top one per cent of men.

A comparison with Thurstone's work is at once suggested, and I propose to make this in some detail, both because of the light it throws upon scale-making, and because it seems to me that Thorndike has hardly received the recognition in this matter which is his due. Before calling attention, however, to the resemblances and differences in Thorndike's and Thurstone's scaling methods, I must say something about certain assumptions which underlie both, and mention some parts of Thorndike's technique which are not relevant to a comparison between them.

The almost, if not quite, universal assumption of scale-makers is that intellect, in a grade group or an age group, is normally distributed among the members of the group, when truly measured. With Thorndike this is not a mere assumption, but is supported by a wealth of data and calculation, the general argument being that distributions of face-value scores, obtained from many tests made and scored by people who were not trying to get normal distributions, depart some in one direction, some in another, from normality, while their composite distribution is almost

[1] Thorndike, E. L. *The Measurement of Intelligence.* Bureau of Publications, Teachers College, Columbia University, New York, 1926.

perfectly normal;[2] and this cannot be due to chance error, for reducing that leaves the normality unimpaired. On this assumption, the percentage of a group which succeeds in a given test is turned into a "sigma-value" from the normal probability curve. This is a practice common to many workers. Thorndike improves on it by multiplying the sigma-values thus obtained by the correlation of this composite test with the whole group of composite tests which define intellect, or (what is the same thing if the composite tests are numerous) by the square root of the correlation between two composite tests, which is arranged to be about the same for all pairs when the composites are made. These sigma-values are then in equal units, and if a group of subjects existed which could be used to scale all the composites from the easiest to the hardest, nothing more would be required, and the worker could turn his attention to the second part of the problem, obtaining an absolute zero.

In fact, however, no one group is suitable for scaling all the composites. It would be absurd to give large numbers of easy questions to men or large numbers of difficult questions to children. Even if one could do this, the percentages of success would be so near zero or one hundred that the sigma-values would have enormous probable errors. It is necessary, therefore, to use a succession of groups, usually of older and older children and then of undergraduates and graduates; and necessary to be able to pass from one group to the next, to know the distance on an intelligence scale from the mean of one to the mean of the other, and to compare the sigma unit of the one with the sigma unit of the other. Here I come to my comparison of Thorndike with Thurstone, for, as I shall show, Thorndike, independently and in the same year (1925), solves this problem by exactly the same principles as Thurstone, though Thurstone's method is superior in two technical respects.

Thurstone's principles of scaling are given, as regards equal units, in the October, 1925, number of the *Journal of Educational Psychology;* and, as regards the absolute zero, in the *Psychological Review* of May,

[2] *Too* perfect, the statistician would say. There is, I hope, something wrong in the calculation of P=.999999 given on page 527 of *The Measurement of Intelligence.* My colleague, D. N. Lawley, thinks that there is probably an error to correct. He thinks Thorndike's value for χ^2 should be multiplied by eleven (there were eleven single distributions). So high a value of P causes as much doubt as a low value. See R. A. Fisher's *Statistical Methods for Research Workers,* 6th edition (London, 1936), section 20, p. 84.

1928. It is the first of these articles with which I am at present concerned. Thurstone there proves the following two formulae, on the assumption of similarly shaped distributions of intelligence in each of two groups (1 and 2) when set off on the same base line, namely,

$$\sigma_1 s_1 = \sigma_2 s_2 \qquad (1)$$

and $$M_2 - M_1 = \sigma_1 m_1 - \sigma_2 m_2 \qquad (2)$$

where M = the average intelligence of a group,
σ = the standard deviation of intelligence of a group,
m = the mean of the sigma values of the tests in a group,
s = the standard deviation of the sigma values in a group,

it being understood that m_1 and s_1 in the one group and m_2 and s_2 in the other group refer to the same tests, namely, those tests which can be reasonably given to both groups (in practice, those in which at least 10 per cent and not more than 90 per cent of the group can succeed). The first of the two equations then gives the ratio of σ_1 to σ_2, and the second equation gives the distance between the mean intelligences, $M_2 - M_1$, in terms of either σ_1 or σ_2. These equations, as is said above, assume that the two distributions of intelligence are of the same shape (in practice, that they are both normal) *when set off on the same base line;* and in such case the set of sigma-values in group 1 will be perfectly correlated with those in group 2. The approximation of this correlation to unity is therefore a condition which Thurstone explicitly requires to be fulfilled, a precaution for which he must be given full credit.

This scaling method of Thurstone's is very elegant. But I have to point out that Thorndike, without actually writing any equations, used exactly the same two principles as are explicit in equations 1 and 2 in making his CAVD scales. He falls behind Thurstone, it is true, in two respects: he does not explicitly use the criterion of almost perfect correlation between the sigma-values in two groups (though he implies it), and in his equivalent to equation 1 he uses the *range* of the sigma-values instead of their standard deviation *s*.[3]

This particular example refers to the four composite tests NOPQ which were given to grades 13 and 17. The resulting sigma-values (cor-

[3] For one example among many of his application of this modification of equation 1, see *The Measurement of Intelligence*, page 304.

rected) are given in the two right-hand columns of Thorndike's Tables 113 on page 305 in *The Measurement of Intelligence* and are reproduced here, together with the values of m and s which I shall need below.

	Grade 13	Grade 17
N	—1.07	—2.13
O	.05	— .77
P	.66	— .17
Q	2.21	.85
m	.4625	— .555
s*	1.3676	1.2449

Now on these numbers Thorndike (at the top of page 304) operates in this way:

$$\begin{aligned}
\text{Composite O} - \text{Composite N} &= 1.12\,\sigma_{13} \text{ and } 1.36\,\sigma_{17},\\
\text{Composite P} - \text{Composite O} &= .61\,\sigma_{13} \text{ and } .60\,\sigma_{17},\\
\text{Composite Q} - \text{Composite P} &= 1.55\,\sigma_{13} \text{ and } 1.02\,\sigma_{17}.
\end{aligned}$$

These three equations give as estimates of the required ratio of the sigmas of grades 13 and 17 the three values,

$$\sigma_{13}/\sigma_{17} = 1.21, \text{ or } .99, \text{ or } .66.$$

Thorndike adds to these estimates one based on the whole range,

$$\text{Composite Q} - \text{Composite N} = 3.28\,\sigma_{13} \text{ and } 2.98\,\sigma_{17},$$

which gives—

$$\sigma_{13}/\sigma_{17} = .91,$$

and he might have taken other bits of the range, such as P — N, or Q — O, etc. If he had taken all possible pairs and averaged all the ratios he would have got .942. Obviously this is rather crude, and the method gives no way of deciding how to combine the discrepant values for the ratio of the two sigmas into one best value. But equally obviously the principle is clear that the ratio of the sigmas of the two groups is inversely proportional to measured distances between tests,

$$\frac{\sigma_{13}}{\sigma_{17}} = \frac{\text{range}_{17}}{\text{range}_{13}},$$

* In calculating s I have estimated the variance, following R. A. Fisher, by dividing the sum of the squares by 3 instead of by 4. But it is immaterial which divisor is used as only the ratio of the s's comes into Thurstone's formula.

(exactly as though I were told that a certain distance were 1760 yards or 1609 meters, and deduced that a meter is 1.094 yards). This is also Thurstone's principle, except for the refinement—an important practical point to the statistician—of using the standard deviations of the sigma values instead of the crude distances between them. If we apply Thurstone's method to this example, we get—

$$\frac{\sigma_{13}}{\sigma_{17}} = \frac{S_{17}}{S_{13}} = \frac{1.2449}{1.3676} = .91,$$

which (but only by a fluke) is identical with the value Thorndike gets when he uses the whole range. There are many other examples in *The Measurement of Intelligence* where Thorndike uses the same principle. *Throughout he appreciates the fact that the sigma of intelligence will be different at different ages.*[4]

In the *Journal of Educational Psychology* for November, 1927, Thurstone again described his method, and used data presented by Trabue in *Completion-Test Language Scales*[5] to illustrate it. And in this 1927 article it is repeatedly stated that Thurstone's method is an improvement on Thorndike's, meaning Thorndike's method as used by Trabue in 1916. On page 509 it is specifically stated that the adjustment for variation in dispersion in different groups is not made by Thorndike. Now it is true that it was not made in 1916. But by 1925 it had been made, and that by a method identical in principle, though cruder in statistical technique. This had apparently not been noticed by Thurstone, and I am not surprised, for Thorndike gives no equations, and in the absence of equations it is often difficult to see the wood for the trees. But if Thurstone missed it, it is certain that most others will have missed it, which justifies me, I hope, in calling attention to Thorndike's claim to equal priority. Even in 1928, in the *Journal of Educational*

[4] The preface to *The Measurement of Intelligence* says that it is the fruit of investigations carried out between July 1, 1922, and July 1, 1925; and it is listed under 1925 (with the note "In press") in the Thorndike Bibliography in the February, 1926, issue of the TEACHERS COLLEGE RECORD. The CAVD tests were published during 1925. Thurstone's article appeared in October, 1925. It seems probable, therefore, that the two methods were developed independently. Thurstone, in his 1925 article, makes no mention of Thorndike. Thorndike makes no mention of Thurstone.

[5] Trabue, Marion Rex. *Completion-Test Language Scales.* Contributions to Education, No. 77. Bureau of Publications, Teachers College, Columbia University, New York, 1916.

Psychology, there is a controversy about scaling between Thurstone and Holzinger, where apparently *both* of them were unaware that Thorndike, in scaling his CAVD tests, had allowed for the differences in dispersion of intelligence in different groups.

There is, however, no resemblance between Thurstone's and Thorndike's methods of locating the absolute zero of intelligence. Thurstone does it by noting that values of σ and M when plotted for different age groups form a straight line; and he continues this line backward until σ is zero, at which point he places his zero for M also. He is confirmed by finding that this zero is about at birth, or a little before.

Thorndike's method is more brutal, but effective. He makes tasks which appear to cover the range from his composite A downward to the easiest "tasks" he can think of, and he asks a jury of forty experts to place these in order of difficulty. He thinks that the task they placed as easiest is as near zero intelligence as matters—it was to spit out an object of nasty taste, and to retain in the mouth an object of pleasant taste, more often than not—and he measures the distance up the scale of items by the principle that if the experts were unanimous that item i is more difficult than j, then the two items are far apart, whereas, if only a bare majority of the experts place i as more difficult than j, the two are near together. It is in this way that, in units which are roughly equivalent to 1½ years of mental age, but which are equalized throughout the scale, he arrives at the conclusion that composite A had altitude 23, and then by the method already explained goes up the scale to composite Q with altitude 43.

AREA OF INTELLECT

The concept of *altitude* of intellect is a common one. When the ordinary man speaks of anyone as very clever, he means in the main that this someone can do difficult mental feats which can be done by only a few. And it is altitude which the CAVD absolute scale, and other absolute scales, measure on the whole—though not entirely. Of the "dimensions" of intellect, altitude is the most precious, for it is, as Thorndike remarks, irreplaceable. Width—which means the number of tasks within the intellect's power at any given altitude—can be got from the combined work of a team of men. Speed, in many cases, can also be got

from a team of men, if the work is such that they can get at parts of it individually. But no team, however large, of average men can write a book on differential equations, or discover, except by some accident, how to make a green dye which will not fade in the sun, or what is the cause of hydrophobia.

The idea of *speed* is also fairly common. There is a widespread belief in the existence of individuals who are slow but profound thinkers—a belief which is more strongly held among parents and teachers, I fancy, than among experimental psychologists. And intelligence testers are often accused by their critics of confusing speed with altitude. Neither altitude nor speed were new ideas when Thorndike enunciated them.

But the ideas of *width* at any given level, and of *area* of intellect, had not I think been enunciated clearly before, and Thorndike's statement of them deserves more detailed examination. The idea is that two men, A and B, of the same altitude of intellect, may differ in the number of tasks of that degree of difficulty which they can succeed in. The total number of tasks of all altitudes which each man can succeed in is the area of his intellect. A third man, C, may therefore have the same area of intellect as A, although of different altitude.

One obvious practical difficulty here is the impossibility of saying how many tasks there are at any level, or at all. Clearly the number is infinite unless defined somehow. But it is equally certain that the idea of area does correspond to something which the world recognizes, the difference between the specialist and the all-round man, the man who is "second best all round" as Plato makes Socrates say in "The Rivals" (if Plato is indeed the author of that dialogue). Generally we have the feeling that the man who has spread his intelligence over many studies, and become very good but not excellent in them all, could probably have excelled in one had he devoted himself to it. He at least consoles himself with that thought. And, in that sense, area is perhaps a better measure of intellect than altitude (though for myself I think the shape of the area is a matter of some importance; preferably a wide base and a high steeple). But at this point one asks oneself whether one is not approaching very near to Spearman's idea of mental energy which can be directed, at any rate in youth, equally well in any direction.

A careful reading of Thorndike I think makes it clear that he would

probably urge that altitude and width are not just alternative ways of draining the available mental energy; he would not, I think, consider that area was a fixed potential in a man, its "shape" in the form of altitude and width a consequence of environmental or even accidental circumstances. He would, I think, consider that there is something which determines altitude separately, to some extent, from width. But he does not distinguish, in his practical measurements, between original, potential altitude and altitude actually reached.

An example of a test in which area, and not altitude, is measured, is the ordinary Binet Scale in any of its revisions. Here the number of tasks at each level is arbitrarily made equal. Thorndike believes that a Binet Mental Age really increases with altitude—the Binet Mental Age is not determined by success with the task highest up the scale but by the total number of tasks performed successfully; that is, two children of the same age might be given the same I.Q., one of whom succeeded with tasks which were one, two, or even three years above the three most difficult tasks which the other one could do, provided that the other succeeded with more tasks in the less difficult class.

THE STRUCTURE OF INTELLECT

It is clear that beneath these questions of altitude and area there lies the problem of the *structure* of the intellect, and as soon as we raise that problem we come to closest quarters with Thorndike's attitude toward the line of thought which began with Spearman's work in 1904, and has continued through the various branches of what is today called factor analysis. We have been speaking of "*the* intellect" as though it were a homogeneous thing, although by the very definition of the particular form of intellect under discussion (CAVD) it has parts, and two men who have the same altitude and the same area of this intellect may differ in the way they attain these, the one man being perhaps strong in C and A, the other strong in V and D. Thorndike, it is true, is at considerable pains to show that his intellect CAVD is "homogeneous," but by that he does not mean what is meant by homogeneous in the preceding sentences. He means only that each composite of his tests is very highly correlated with each of the others, a very different matter, for this could be attained without CAVD needing to be structureless—for ex-

ample, by the saturations with the different factors being kept in the same proportions, to speak the language of the factorists.

This selfsame question arises in the matter of absolute scaling discussed earlier in this article. The methods of Thurstone and of Thorndike depend on the assumption that the tests can be placed at points, on the base line of intelligence measures, which are absolute and fixed and not dependent on the age group of persons being tested. The positions of these points, as found from one group, are in fact equated as nearly as may be to their positions as found from another group, with a one-to-one relationship. This can only be the case if what is being tested is *one thing*, without parts; or, alternatively, if all the parts of what is being tested (if it has parts) either are in the same proportions in each test, or all grow and mature at the same rate. For suppose that what is being tested depends on two or more factors, say p, q, etc., that the different tests depend in different proportions on p and q, and that these mature at different rates. Then in one age group the order of difficulty of the tests may mainly be decided by their p-saturations, if we imagine the group to be immature in q, while in a later group the q-saturations may be the preponderant influence; and thus two tests, if they differ in their proportionate composition in p and q, may even be inverted in order of difficulty. The assumption, that is to say, is that what is being tested is either structureless, or that, if it have structure, this cannot be detected because it never changes from test to test or from age to age.

Now I do not for a moment think that Thorndike looks upon intellect CAVD as structureless (and certainly Thurstone does not), so it seems that there is no fundamental antagonism between Thorndike's work on the measurement of the intellect and that of either Spearman or any of his disciples or successors, but only a simplification by Thorndike for the sake of practical utility. The difference between Thorndike on the one hand, and Spearman and Thurstone on the other, is one of relative emphasis on the possible underlying *causes* of the correlations observed. The usual descriptions of the difference between these two points of view are very one-sided, and emphasize certain points so as to make the cleavage appear much more complete than it has ever really been—at any rate on Thorndike's side, or on my side, insofar as I come into the matter through the fact that my Sampling Theory is in many

ways congruent with Thorndike's ideas and has been held to oppose factor theories. Both Thorndike and I oppose factor theories only insofar as they postulate a real existence for their factors. As mere shorthand *descriptions*, they are not fundamentally assailable, whatever criticisms of detail may be called for.

Now Thorndike's concept of the intellect, and indeed all his psychological work, is dominated by his hypothesis that the ultimate unit of the mind is, or accompanies, the simple *bond* which unites a simple response to a simple stimulus. The mind is for him built up of such bonds, almost infinite in number, and extremely intricate in their interconnections; and it is natural to associate each *bond* in the mind with a neural arc in the body. There is, however, nothing in such a view to prevent its holder appreciating a descriptive account of the correlations between tests in terms of a few general factors, though for him the "factors" will not be entities of the same sort of reality as a neural arc, but will rather be mathematical coefficients which form an approximate shorthand description of the actually far more complex phenomena.

There is no doubt that the real point at issue in the controversy between what Spearman has called the "monarchic" and the "anarchic" theories of the intellect is this question of the degree of real existence to be attributed to the entities into which the observed phenomena are analyzed. Thorndike's bonds are fairly real things, in the ordinary sense of the word "real." On the material side, neural arcs are known to exist in the same sense that chairs exist. It is true that single neural arcs are perhaps not isolable, and that neural arcs differ very much from one another neurologically. But chairs also differ. And the neural arc remains a pretty real thing. What mental accompaniment it has is more doubtful, but it is generally accepted that some neural arcs arranged in patterns and weavings and surgings are accompanied by what we call consciousness, and in certain cases by what we call intelligent thinking.

Whether a similar degree of reality can be attributed to those larger elements which factorists arrive at is doubtful. The chief such factors in one school of thought are Spearman's g, followed by v, the verbal factor, k, the spatial factor, etc. For g a material basis has been suggested in Spearman's hypothesis that it is the available amount of "mental energy," though it is questionable if mental energy is meant to be an

energy in the physicists' sense—on the whole, I think not. For *v*, and *k*, and the like, I doubt if any material basis has ever been suggested except, no doubt, that they are due to habitual patterns among the neurones, which brings us back to Thorndike's bonds again. Behind practically every sentence and paragraph that is written about this question of factors, or of faculties, is the question of the degree of reality to be attributed to them. For instance, speaking of Spearman's 1904 views,[6] Thorndike said (sometime before 1914): "In the words of Spearman, 'All branches of intellectual activity have in common one fundamental function (or group of functions) whereas the remaining or specific elements of the activity seem in every case to be wholly different from that in all the others.' This doctrine requires not only that all branches of intellectual activity be positively correlated, which is substantially true, but also that they be bound to each other in all cases by one common factor, which is false."

Both Spearman and Thorndike, in making these statements must have had in their minds, or at the back of their minds, some notion of how real and existent a thing a "fundamental function" or a "common factor" is. For if all branches of intellectual activity are correlated, they *can* undoubtedly be explained by hypothetical factors of which one is common to them all and equally undoubtedly they *need not* be so explained (unless the correlations are all very high). There is in general nothing whatever in the correlations to favor the one view more than the other, and the difference of opinion is entirely one of preferring a few large factors, or very many small bonds, for other reasons. Spearman was much impressed at the time by the empirical fact that tetrad-differences are small—he thought they were more invariably small than later turned out to be the case—and he had discovered that a common factor and specifics would give this result. Thorndike, on the other hand, had always before his mind the fact that the brain and nervous system is composed of neural arcs, and is not at all obviously divided into a few compartments or departments: and therefore he denied the existence of a common factor. The whole thing turns on what we mean by a common factor.

[6] *Educational Psychology*, Vol. 3, pp. 363-364. A footnote points out that Spearman's later writings supplemented these views.

BONDS AND FACTORS

I will, I hope, be forgiven for saying that I think my own work and that of my students and colleagues in connection with what has been called the Sampling Theory form a link between Thorndike's view of the mind as composed of "bonds," and the view of Spearman or Thurstone of mind as composed of "factors." Both views, in my opinion, are right, each in its own way. For, if the mind be composed of innumerable bonds, then it can be shown that, supposing different mental activities to call upon different groups of these bonds, the correlations which result from some bonds being common to two activities will be interrelated in exactly the same way as if such correlations were produced by a few factors. If the bonds are not linked up permanently in any special fashion by heredity or by education, the correlations will be "hierarchical," with tetrad-differences tending to vanish—in which case Spearman's Theory of Two Factors would be a perfect description of them, whether or not the correlations corresponded to the actual mechanism of their causation. The equations of the Sampling Theory and those of the Theory of Two Factors can be transformed exactly into one another by an orthogonal transformation, in either direction.[7] There is no mathematical possibility of detecting any difference.

If, on the other hand, the bonds are linked up with one another, in linkages which are in some cases loose and uncertain, but in other cases (and especially with advancing years) rigid and unchanging; in linkages which may be hereditary or which may be acquired; then tetrad-differences will not be zero. Then one general factor will no longer suffice to imitate the correlations, but several will be required. And if the linkages can be sorted out even approximately into groups, then the number of common factors will probably be that of these linkage-groups. That does not mean identifying the factors with the linkage-groups, if by factors is meant orthogonal factors, for the linkage-groups will not be uncorrelated. These linkage-groups may be separate entities in the sense that patterns are different, in the same way that, for example, the Trade Union of plumbers is a different entity from the Primitive Methodist Church. But the men who compose the former society are not an entirely

[7] *British Journal of Psychology*, Vol. 26, p. 85, 1935.

different body of men from those who compose the latter. Some plumbers are also Primitive Methodists; and some Thorndikean bonds are common to two different linkage-groups. The probability is therefore that the orthogonal factors found by factorists, just because they are orthogonal, cannot be rotated into any position in which they correspond with something real, if by something real we mean something corresponding to neural patterns.

Thorndike himself has made a practical suggestion concerning a new kind of factor which is worthy of mention here, especially as this suggestion appears in a book which may not come to the notice of all psychologists, namely, the report of the Conference on Examinations held at Dinard, France, in 1938 (during the fateful days when Chamberlain was flying to and from Germany) between the various national committees of the Carnegie International Examination Enquiry.[8] As he pointed out, a test of (for example) arithmetical skill, or of German vocabulary, can be so worded and arranged that intelligence is of practically no help *during the test*. A measurement made in this way will of course be correlated with intelligence, since a man of intelligence will, in the months and years preceding the test, have acquired more arithmetical skill than will a stupid man, and "factors," if one can thus call them, of this kind will be highly correlated with one another. There is indeed, I think I can say, not much trace[9] in Thorndike's work of any desire to arrive at *orthogonal* factors. He does not want theoretical factors, I feel safe in saying. He wants practical measures of more wholesale abilities utilizable as they stand for practical purposes. He would measure both a man's mental height and his mental weight—to use an analogy—just as we always measure a man's height and weight although these are highly correlated. We do not find it practical to analyze height and weight (as we could do) into two hypothetical uncorrelated variates; and, similarly, Thorndike does not analyze CAVD into orthogonal factors. He is content to measure C, and A, and V, and D and quote these even although they are highly correlated. These are for him, and

[8] *Conference on Examinations*. Edited by Paul Monroe. Bureau of Publications, Teachers College, Columbia University, New York, 1939.

[9] In *The Measurement of Intelligence*, p. 481, he does say, however, that "it is desirable to settle on the most fundamental and mutually exclusive abilities and to measure them first."

I claim for us all, real things, either in the sense of bond patterns which I have been emphasizing above, or, more practically, in the sense of *inventories of tasks*. The "factor" *intellect C* is defined by an actual inventory of tasks, and so also are A, V, D, O, I, and any others. Orthogonal factors cannot be so defined. The later ones, as *v* and *k*, obviously cannot, for *g* will always be mingled with them in any inventory. The ruling factor *g* itself cannot be defined by a simple inventory, though it can be defined by a set of "hierarchical" tasks plus a theory and considerable calculation—even then only with the remark that the actual defining battery set up by Brown and Stephenson contains also a lot of *v*.

I cannot leave this question of *factors versus bonds* without speaking of Thorndike's energy and tact, during several years, in acting as chairman of the committee formed in America, after Spearman's retirement from his London chair, for the purpose of conducting large-scale and expensive experiments and inquiries into factor theories, a committee which has encouraged (and fertilized financially) numerous investigations both theoretical and experimental in this field.

THE QUANTITY HYPOTHESIS

The most important piece of writing of Thorndike's concerning his view that the "bonds" of association are the causal fundament of the mind is Chapter XV on "The Nature of Intellect," in *The Measurement of Intelligence*, in which he enunciates his so-called "Quantity Hypothesis" of the intellect. The chapter is, from the point of view which I have been taking in the last few pages, interesting not only for the description of that hypothesis, but also, and especially, because the mathematical methods which Thorndike uses to support it are practically identical with those which Spearman has used to support his *g* hypothesis. The fact is thus forced upon one's notice that both interpretations satisfactorily explain the correlations, and one's attention is drawn to the real difference between the hypotheses, namely, that they ascribe the correlations to different causes, although they can both describe them, and describe them equally well.

The Quantity Hypothesis asserts (page 415, *The Measurement of Intelligence*) that "in their deeper nature the higher forms of intel-

lectual operation are identical with mere association or connection forming, depending upon the same sort of physiological connections but requiring *many more of them.* By the same argument the person whose intellect is greater or higher or better than that of another person differs from him in the last analysis in having, not a new sort of physiological process, but simply a larger number of connections of the ordinary sort." . . . "The essential element of [the] hypothesis is that it offers a purely *quantitative* fact . . . as the cause of *qualitative* differences[10] (page 417), either in the kind of operation (e.g., association *versus* reasoning) or in the . . . result obtained (e.g., truth *versus* error, wisdom *versus* folly), so far as these qualitative differences are caused by original nature" (page 417). . . . "This greater fund of . . . connections . . . have some anatomical or physiological cause or parallel" (page 420). . . . "Any person familiar with the finer anatomy of the brain will at once think of the number of possible contacts (or possibly coalescences) of the fibrils of axones with dendritic processes in the associative neurones . . . We do not, however, make the hypothesis depend upon this particular [interpretation]" (page 422).

"The hypothesis," Thorndike goes on to say (page 422), "may be submitted to an almost crucial test by determining the correlations within the upper half of intellect, those within the lower half, and those between the upper and lower halves," and he then makes certain calculations on correlation coefficients, in support of his Quantity Hypothesis, *which are exactly the same as Spearman would make in support of his g Hypothesis.* It is extremely interesting to notice this and to observe that the same data, giving the same numerical results, suggest to Spearman one common and dominating factor, while to Thorndike they appear to prove the fundamental cause to be innumerable connections.

[10] The Quantity Hypothesis was perhaps first *explicitly* enunciated in *The Measurement of Intelligence:* but it is implied in many sentences of Thorndike's long before then. As early as 1901, at the age of 27, he wrote (*Popular Science Monthly* for November) "The intellectual evolution of the race consists in an increase in the number, delicacy, complexity, permanence, and speed of formation of associations (between situation and response). In man this increase reaches such a point that an apparently new type of mind results, which conceals the real continuity of the process." (Quoted by Stone in the Thorndike number of the TEACHERS COLLEGE RECORD, February, 1926.) In this, the production of qualitative differences by quantitative changes in the number of associations is clearly envisaged.

This does not surprise me, since I hold both interpretations to be descriptively interchangeable. For deciding which is the *causal* explanation, other arguments than mathematical calculations are needed, and these Thorndike also gives, as I shall show in due course. First, however, let us examine the "crucial test," which Thorndike employs, by considering the correlations within and between the upper and lower halves of intellect.

The experiments (made by Dr. J. W. Tilton) used as measures of the *higher* activities sentence completions, arithmetical problems, and analogies. As measures of the *lower* activities they used vocabulary tests, routine and informational arithmetic, and information tests, and the correlations were corrected for attenuation. Thorndike then calculated the relation between what is common to any two of the higher tests and what is common to any two of the lower tests, by a formula analogous to Spearman's attenuation formula. For example, the correlations between the two higher tests Co and An and the two lower tests V and Inf were as here shown (*The Measurement of Intelligence*, page 426):

	Co	An	V	Inf
Co	—	.522	.865	.722
An	—	—	.563	.604
V	—	—	—	.787
Inf	—	—	—	—

The correlation between what is common to Co and An and what is common to V and Inf is then calculated as,

$$\frac{\sqrt[4]{(.865 \times .722 \times .563 \times .604)}}{\sqrt{(.522 \times .787)}} = 1.06,$$

that is to say, what is common to the two higher activities is identical with what is common to the two lower.[11] Thorndike concludes in the first place that "there seems reason to refer the higher, originating, directing abilities to much the same fundamental causes as the [lower] associative."

Now, as I have said, calculations exactly like these were made by

[11] Nine such measures are quoted on page 425, the lowest being .82 and the median 1.06.

Spearman in 1904 (*American Journal of Psychology*, Vol. 15, p. 269), with similar numerical results: and his conclusion was that there is a common factor *g* which is the sole cause of the observed correlations. Yet here is Thorndike concluding that these calculations prove the truth of the Quantity Hypothesis. Clearly we must follow Thorndike further to see why he adopts his own explanation and rejects Spearman's, which obviously is a possible explanation. The calculations themselves are as much in favor of *g* as of bonds. We find Thorndike's further argument on page 430. We must, he says—since the figures show that mere association and the higher abilities have in the main the same cause—either (1) place the causation of associative (i.e., the lower) ability in the higher ability, or (2) seek a common cause for both which is different from either, such as a general mental energy, or (3) suppose associative ability to cause the higher ability. "The first of these assumptions is absurd, because associative ability occurs abundantly without any trace of the higher abilities, but these never occur without it. . . ." "If either [ability] is to be derived from the other, it is surely best to derive the higher abilities from the associative abilities." "The second assumption (i.e., Spearman's) is tolerable," but is "meaningless until the 'energy' or 'vitality' is expressed as some fact known to science. What shall that fact be? . . . We can think of no fact so suitable as the physiological parallel of number of mental connections" (page 431). And Thorndike winds up the chapter by remarking that "what little is known of the status of the neurones in very dull individuals is in harmony with the quantitative theory" (page 435). I may at this point perhaps interpolate a quotation from my own reading of works on the anatomy of the brain which seems to lend support to the Quantity Hypothesis. J. E. Fulton, in his *Physiology of the Nervous System*,[12] says that: "Cajal assumed that the large number of cells with short axons was the anatomical expression of the delicacy of function of the brain of man. At present that assumption is almost a statement of fact, for it is known that synaptic transmission demands the summation of impulses under strict conditions, and it is evident that the more heterogeneous is the origin of the synapses on the cells with descending axons, the more

[12] Fulton, J. E. *Physiology of the Nervous System*, p. 316. Oxford University Press, Oxford, 1928.

rigid become the conditions for threshold stimulation, and the more accurate the selection of the paths through which the impulses may be conducted."

It is abundantly clear from all this that the Tilton experiments, and the calculations made upon them, do not by their numerical results decide against *g* and in favor of bonds, if I may use two short titles for the theories which imagined themselves to be opposed. The numerical results are compatible with either hypothesis and therefore prove neither. Exactly similar results had indeed been put forward by Spearman as proving the existence of *g*, as these are here put forward by Thorndike (the reader at first supposes) as a crucial proof of its nonexistence. But as we have seen, Thorndike, after considering the results, definitely says in so many words that they are explicable as due to a common cause. It is *in the interpretation of what that cause is* that he differs from Spearman, and his support, in adopting his own interpretation, comes not from these numerical calculations but (1) from the circumstance that there are other reasons for thinking that bonds exist, and for considering that upon their number depends the integrative power of the mind or brain, and (2) from the sound scientific maxim that where existing entities will explain a phenomenon, new entities should not be postulated. To *g*, as a mathematical coefficient describing succinctly a phenomenon due to innumerable bonds, there can be no objection. To *g* as an entity such as "mental energy" there is the objection that it is unnecessary and meaningless. To bonds there is no such objection. They already exist, and since they can explain the quantitative phenomena they should be accepted as the causes until they fail to explain some new measurement.

I suppose that to some it may be a stumbling block that, in this hypothesis of Thorndike's, *qualitative* differences arise from purely quantitative changes, arise just because the number of "bonds" increases past a threshold. But that would be, as it seems to me, to object to all science. The quantitative facts of physics enable us to *predict* qualitative changes but do not in any sense *explain* them. As the number of vibrations per second of a light wave increases, the qualitative effect on the human observer changes from what we call red to yellow to green to blue and to violet. Goodness knows why! Indeed to ask *why* is meaningless. It is

just as meaningless to ask why a brain with many connections is accompanied by a mind which is clear and lucid when confronted with a problem, and one with few connections by a mind which is confused. Throughout the history of science advance has always come from a reduction of the phenomena to the arithmetical configurations of elementary items of one sort or another. It will, I think, be the same with psychology, and Thorndike's Quantity Hypothesis is in line with this expectation.

ITEM SELECTION

There is nowadays an immense literature, which badly needs sifting and codification, on the best procedure for selecting additional items to "improve" a test. This work all springs originally from Thorndike's introduction of correlational methods into testing, methods which he has used almost exclusively for practical ends, and only seldom for theoretical purposes. The theory of item-selection contains within itself a fundamental discord, or rather an apparent discord, upon which, bearing in mind the desire of the committee that these articles should not only review and appraise, but should also be constructive in nature, I propose in this final section to offer some remarks. They will bring us back ultimately to the question of orthogonal factors, to the definition of intelligence, and to "intellect CAVD."

The apparent discord concerns the best way in which to increase the efficacy of a test: let us say, to make our remarks more concrete, of a test intended to predict success as a printer. We wish such a test to possess both validity and discriminatory power. Validity is concerned with whether a test measures the right thing, discrimination depends on whether the test spreads the candidates out well. When there is a recognized criterion or independent measure of what is tested, then the validity of the test is estimated by its correlation with that criterion. In this case the mathematics of the regression equation tells us which items to add to improve the validity. They are those items which correlate very differently with the pre-existing battery of items and with the criterion—in practice those which correlate well with the criterion but badly with the battery. The addition of any such item will pull the centroid of the battery nearer to the criterion. But just because such an

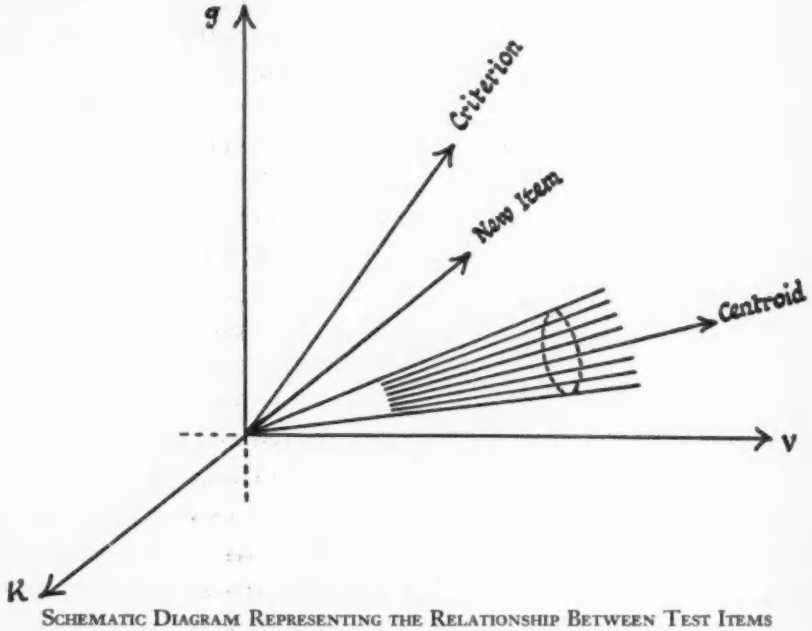
item correlates badly with the preexisting battery it will not be increasing very much the discriminating power of the battery among men.

People who make batteries of test items, however, are very anxious that their tests *should* discriminate very well among individuals. If for simplicity we think of a test of 100 pass-or-fail items, they want it to spread the candidates well out over a large part of the range of 0 to 100, not to crowd them into a small part. They tend therefore to forget the criterion and to add items which correlate very well with the existing battery, and increase its discriminatory power, its natural standard deviation. They make the test measure in finer and finer units just what it has always measured. Their new items do not aim at hitting nearer to the criterion than the old centroid and thus moving it toward the criterion, but aim at hitting the centroid just where it is. And when the criterion is a rather dubious thing anyway, such as the rather offhand opinion of a number of teachers or foremen or other persons about the relative merits of the candidates tested, then in such a case there is a good deal to be said for the attitude of improving the test as a measure of what it does already measure. The test itself indeed, or rather the judgment of the persons who put together its first few items or decided its types of items, has become the criterion *per se*. I shall return to this case presently.

First, however, it is worth while resolving this apparent discord for the case where the criterion is one in which we have every confidence. The problem is best envisaged in the form of a diagram, and to make the diagram more vivid let us speak the language of the factorists and suppose that the quality we are attempting to measure (ability as a printer, for example) is compounded of three orthogonal factors, say g, v, and k. Then in a space in which g, v, and k are measured along the axes of rectangular coordinates, the occupation of a printer will be represented by a vector, by a straight line that is, inclined at the proper angles to the three axes to indicate the proportions of g, v, and k of which printer-ability is compounded, leaning nearest to the most important factor and furthest away from the least, like the line labeled "criterion" in the figure on page 748.

Now clearly, if we could, we would make the items of our test crowd closely round the criterion vector, like the ribs round the stick of a closed umbrella, for then our test would be both valid (having its resul-

tant along the criterion line) and of high discriminatory power (since its items all pull together and do not cancel one another). Another test with more widely spread out items could have the same resultant, like a partly opened umbrella with its stick still along the criterion vector:



SCHEMATIC DIAGRAM REPRESENTING THE RELATIONSHIP BETWEEN TEST ITEMS AND THE CRITERION

but, although equally valid, this second test would not be so fine a discriminator. I am for simplicity, assuming that every item is in itself equally reliable, that the error present in each item measurement is the same.

When, however, we first put together the items of our test, it is certain that their umbrella stick or centroid will not lie along the criterion vector. It will lie somewhere else, as is suggested in our diagram, where, for clarity, we have supposed that the angle between the test-centroid and the criterion is rather large. A new item which is going to make this test more valid must clearly be one whose vector lies on the criterion side of the centroid so that the new centroid will be pulled nearer than before to the criterion. But, as we have already remarked, such a new item will enlarge the spread of the cone of the items round the centroid,

and thus diminish the discriminatory power of the test. Clearly what should be done is to discard items of the cone which are remote from the criterion as well as add items which lean nearer to it, so as to move the centroid in the right direction *without increasing the spread of the cone.* The umbrella stick needs to be brought close to the criterion, but the umbrella must be kept closed, not allowed to open out.[13]

These considerations indicate that for a test to be both valid *and of high discriminatory power* it should ideally be composed of items *each* of which correlates well with the criterion. This appears to me to indicate that it is unwise to put together a test composed of some items aiming at measuring *g*, some aiming at measuring *v*, and some aiming at measuring *k* (to use the three hypothetical orthogonal factors into which we have, purely for the sake of illustration, imagined printer-ability to be analyzed). To do this would be to open our umbrella wide, to spread out the cone of items almost as far as can well be, and thus to diminish the discriminatory power of our test, always supposing the items in themselves to be equally reliable, even although the validity remains accurate. The resultant of the items may be in the proper line: but if they are in several nearly orthogonal directions, they are largely wasting energy in cancelling one another's effects. If this view is correct, factorists who aim at measuring orthogonal factors separately and combining the results into a prediction of an occupation or other criterion, are taking about the worst way possible to get a test of high discriminatory power.

Of course it is clear that we cannot hope to shut the umbrella up tight, we cannot hope to have each of our items almost perfectly correlated with the criterion. We can, however, refrain from going out of our way to open the umbrella. No doubt our items will tend to fall into a few types. But it would be as well to confine these to types which correlate pretty closely with one another, as well as correlating with the criterion. If we care to call the centroid of each type a factor (as factor C, factor A, factor V, and factor D) we may do so. But they will be highly correlated factors.

So far I have been speaking of the case where there exists a separate

[13] The mathematical reader will observe that in the above paragraph and in the diagram I have simplified the matter by supposing everything to happen in three dimensions. In reality, there are as many dimensions as there are items, and until validity is perfect the criterion is not in the same space as the items. But in essence the argument is the same.

and acceptable criterion. But in actual practice such a case never I think arises in a pure form. In my own testing work in England, Wales, and Scotland, which is mainly concerned with selecting children for free places in secondary schools, the criterion is ultimately the School Certificate or Leaving Certificate examination which comes at the end of the secondary school course. It is an independent and a definite enough criterion. The children actually do fail, or pass, or pass with credit, or pass with distinction; and to that extent, whether or not it is acceptable to us, we just have to accept it, and try to make our tests predict it. But we do not in our hearts think it is any better a measure of suitability for secondary school education than our tests are.

Now it is somewhat the same with the definition and the measurement of intelligence. There is no criterion which is infallible, and of universal acceptance. In our figure, there is in fact no firmly drawn criterion-vector called intelligence toward which we have to pull the centroid of our battery of test items. Our battery measures what it does measure. There is of course what one might call a "public opinion" concerning intelligence: but it is very vague. There is the opinion of a group of chosen people (chosen by whom?), say, of schoolmasters, or of psychologists, or of scientists, somewhat less vague but not always in harmony with the opinion of other groups. In measuring intelligence, in fact, we are not measuring something which already exists and is there waiting to be measured. We are *defining intelligence in a quantitative manner*. To avoid misconception we should either avoid the word intelligence (but that would leave the world rather in the dark as to what our tests were all about) or we should qualify it, which is what Thorndike has done in "intellect CAVD," which is, quite definitely, the ability to solve more or fewer of the 680 tasks in his inventory, divided homogeneously into seventeen steps or rungs, whose approximately equal distances apart are, on certain well-supported assumptions, measured in equal units from an absolute zero.

Thorndike's Contributions to the Psychology of Learning

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In 1927 Thorndike launched a series of investigations in the psychology of learning which were to occupy the greater part of his interest and attention during the next four years. With funds supplied by the Carnegie Corporation, an extensive experimental program was undertaken, to test systematically, prevalent beliefs and conclusions regarding learning and to discover, if possible, new facts and principles of importance in the modification of behavior. Well over one hundred distinct, though coordinated, experiments were conducted, with the result that some earlier conclusions were confirmed, some extremely important modifications in position were necessitated, and the boundaries of knowledge regarding the learning process were considerably extended.

Although a number of articles appearing in journals had indicated the progress being made in certain directions, the first systematic account of the project was reported in *Human Learning*[1] (1931). This volume presented, with a minimum of technical detail, the most important findings of the first few years of the inquiry. In the following year appeared *The Fundamentals of Learning*,[2] a volume of more than 600 pages, reporting in minute detail the numerous experiments conducted, and presenting a more extended discussion of the theoretical implications of the findings.

FINDINGS ON THE "LAW OF EXERCISE"

The "law of exercise" or the "law of use" which had occupied a prominent position in most treatises on learning for many years was now

[1] Thorndike, Edward L. *Human Learning*. The Century Co., New York, 1931.

[2] Thorndike, Edward L. *The Fundamentals of Learning*. Bureau of Publications, Teachers College, Columbia University, New York, 1932.

shown to be substantially incorrect. In numerous experiments involving such diverse activities as drawing lines of specified lengths (while blindfolded), connecting numbers with words, and connecting spellings with sounds, it was demonstrated that in the absence of differential after-effects, the repetition of a situation *in and of itself* did not result in the more frequent or stronger connections gaining strength from the less frequent or weaker ones. Although learning theories involving the principle of inhibition through drainage had been viewed with suspicion on logical grounds, they were now shown to be experimentally unsound.

FINDINGS ON THE "LAW OF EFFECT"

A second important change in position necessitated by the experimental findings was in regard to the effect of punishment upon learning. The "law of effect," as formulated many years earlier by Thorndike, asserted that rewards or satisfiers following responses increased the likelihood of repetition of the connections so rewarded, while punishments or annoyers following responses decreased the likelihood of recurrence of the punished connections. At the Ninth International Congress of Psychology held at Yale University in 1929, Thorndike prefaced the announcement of his revision of the "law of effect" with the remark, "I am about to say three words you have seldom, if ever, heard from the lecture platform: 'I was wrong.' " He then proceeded to present the overwhelming mass of evidence which indicated that, while rewards definitely increased the probability of repetition of the rewarded responses, punishments applied as after-effects in a learning situation do not decrease the likelihood of recurrence of the punished responses below the level of chance expectancy.

This radical shift in learning theory was brought about by the introduction of a new analytical technique which made it possible to study separately the effects of rewards and punishments upon connections which they followed. Simple analysis of learning records had shown that as learning progressed the number of right responses at successive trials increased while the number of wrong responses decreased correspondingly. From such data, the rather logical inference was commonly drawn that rewards were responsible for the increase in the number of rights, while punishments were responsible, in large measure, for the decrease in the number of wrongs at successive trials. The new technique devised by

Thorndike analyzes the history of the successive responses to individual items in the learning situation. The measure of effectiveness of any satisfier is the percentage of responses so rewarded at a particular trial which are repeated at the following trial, with appropriate correction for chance recurrence of the response. Conversely, the measure of effectiveness of any annoyer is the percentage of responses punished at a given trial which are *not* repeated at the following trial, correction being made for the probability of chance recurrence.

Experiments in the learning of Spanish vocabulary, in associating a movement with a visual symbol, in estimating areas, in completing words, and many others were planned to throw light upon the mode of operation of annoyers and satisfiers. The data are consistent in indicating that annoyers are not dynamically the opposites of satisfiers. Rewards regularly and predictably increase the likelihood of recurrence of the rewarded connection but annoying after-effects do not consistently decrease the probability of the repetition of the punished connection. In fact, punished connections are quite regularly found to be repeated in a greater percentage of instances than one would expect on the basis of chance alone, even when allowance is made for response favoritism as was done in some of the papers published following the *Fundamentals of Learning*.

A more exact understanding of the manner in which after-effects operate was sought in a long series of experiments by Thorndike or by his associates and students working under his direction. In the *Fundamentals* a number of experiments designed to reveal the role played by revival or rehearsal of the connection led to the conclusion that "a satisfying after-effect of a connection can and generally does strengthen that connection directly, irrespective of repetitions or rehearsals or recalls of the connection and of images or other representations of the after-effect" (page 270). A further study of this same problem was reported in 1935 by Thorndike.[3]

That even in the absence of awareness of what is being learned or without special intention to learn it, after-effects have the power to modify behavior as shown in the *Fundamentals* and in a later study by

[3] Thorndike, Edward L. "Direct Action of Rewards Upon Mental Connections and Their Indirect Action Via the Stimulation of Inner Equivalents of the Connections." *Journal of Experimental Psychology*, Vol. 18, pp. 91-96, February, 1935.

Thorndike and Rock.[4,5] Lorge and Thorndike[6] compared the influence of punishment with the influence of a neutral after-effect and in a later paper[7] the same authors reported experiments on the effects of relevance and belonging. Thorndike,[8,9,10] working with humans, and Lorge,[11] working with animals, published further studies on relevance. The effect of delay in the application of after-effects was studied by Lorge and Thorndike[12] and later by Forlano.[13] The influence of the relative difficulty of the task was investigated by Thorndike and Woodyard.[14] The effect of supplementing the statement "Right" by money rewards and the statement "Wrong" by an electric shock was studied by Lorge.[15] Rock[16] varied the amount of money rewards and penalties applied as

[4] Thorndike, Edward L. and Rock, Robert T., Jr. "Learning Without Awareness of What is Being Learned or Intent to Learn It." *Journal of Experimental Psychology*, Vol. 17, pp. 1-19, February, 1934.

[5] Thorndike, Edward L. and Rock, Robert T., Jr. "A Further Note on Learning Without Awareness of What is Being Learned." *Journal of Experimental Psychology*, Vol. 18, pp. 388-389, June, 1935.

[6] Lorge, Irving and Thorndike, Edward L. "The Comparative Strengthening of a Connection by One or More Occurrences of it in Cases Where the Connection Was Punished and Was Neither Punished nor Rewarded." *Journal of Experimental Psychology*, Vol. 16, pp. 374-382, June, 1933.

[7] Thorndike, Edward L. and Lorge, Irving. "The Influence of Relevance and Belonging." *Journal of Experimental Psychology*, Vol. 18, pp. 574-584, August, 1935.

[8] Thorndike, Edward L. and Others. "The Spread of the Influence of Reward to Connections Irrelevant to the Learner's Purposes." *Journal of Genetic Psychology*, Vol. 44, pp. 428-436, June, 1934.

[9] Thorndike, Edward L. "The Influence of Irrelevant Rewards." *Journal of Educational Psychology*, Vol. 24, pp. 1-15, January, 1933.

[10] Thorndike, Edward L. (With the Institute Staff.) "Influence of Irrelevant Continuing Discomfort upon Learning." *Journal of Genetic Psychology*, Vol. 44, pp. 444-448, June, 1934.

[11] Lorge, Irving. "Irrelevant Rewards in Animal Learning." *Journal of Comparative Psychology*, Vol. 21, pp. 105-128, February, 1936.

[12] Lorge, Irving and Thorndike, Edward L. "The Influence of Delay in the After-Effect of a Connection." *Journal of Experimental Psychology*, Vol. 18, pp. 186-194, February, 1935.

[13] Forlano, George. *School Learning with Various Methods of Practice and Rewards.* Contributions to Education, No. 688. Bureau of Publications, Teachers College, Columbia University, New York, 1936.

[14] Thorndike, Edward L. and Woodyard, Ella. "The Influence of the Relative Frequency of Successes and Frustrations upon Intellectual Achievement." *Journal of Educational Psychology*, Vol. 25, pp. 241-250, April, 1934.

[15] Lorge, Irving. "The Efficacy of Reward and Intensified Punishment." *Journal of Experimental Psychology*, Vol. 16, pp. 177-207, April, 1933.

[16] Rock, Robert T. Jr. *The Influence Upon Learning of the Quantitative Variation of*

after-effects and Tuckman[17] concerned himself with variations in the intensity of negative after-effects. Thorndike and Forlano[18] studied the effect of increasing and decreasing the amount of reward during the learning period, though here the action of the reward was probably more in the nature of an incentive than an after-effect. The potency of a state of satisfaction carrying little or no knowledge about the success or failure of a response was compared by Eisenson[19] with that of a state of satisfaction which had added to it knowledge that the connection was successful. Applying after-effects while the situation was still present was compared by Waits[20] with the results obtained by applying them after the removal of the situation.

Thorndike and his students have demonstrated that learning proceeds by the action of positive after-effects and not by the action of negative after-effects. This finding was true when the subject was clearly informed about which connections were to be learned, as well as when the subject was unaware of which connections were to be learned, and even when the subject had no intention to learn a set of connections. Further, systematic variations in the amount of reward and in the amount of punishment applied as after-effects for specific connections gave evidence to strengthen the conclusion that rewards act primarily by confirming in the individual, then and there, whatever response tendency was rewarded. Punishment has no such demonstrable effect in reducing the response tendency, either by eliminating the punished connection or the tendency to respond in a given way. Even when the subject has the advantage of correcting his erroneous tendency before proceeding to the learning of other connections, the fact that he made a wrong connection will have

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After-Effects. Contributions to Education, No. 650. Bureau of Publications, Teachers College, Columbia University, New York, 1935.

[17] Tuckman, Jacob. *The Influence of Varying Amounts of Punishment on Mental Connections*. Contributions to Education, No. 590. Bureau of Publications, Teachers College, Columbia University, New York, 1933.

[18] Thorndike, Edward L. and Forlano, George. "The Influence of Increase and Decrease of the Amount of Reward upon the Rate of Learning." *Journal of Educational Psychology*, Vol. 24, pp. 401-411, September, 1933.

[19] Eisenson, Jon. *Confirmation and Information in Rewards and Punishments*. Archives of Psychology No. 181. Columbia University, New York, 1935.

[20] Waits, J. V. *The Law of Effect in the Retained Situation*. Archives of Psychology No. 208. Columbia University, New York, 1937.

done more harm by having occurred in the individual than correction or reward can offset. It seems that, from the point of view of the theory of learning, Thorndike has demonstrated clearly the plausibility and acceptability of the law of effect, particularly demonstrating the significance of the consequences of satisfaction and reward (or their mental or social equivalents). These contributions to the law of effect can safely be regarded as the fundamental contribution of Thorndike in the last decade.

THE PRINCIPLE OF "BELONGINGNESS"

The principle of "belongingness" (which Sandiford calls "that horrible word") represents one of the important new concepts which grew out of experimental work on other aspects of learning, and which was itself then subjected to experimental scrutiny. Belongingness is not strictly defined by Thorndike, but numerous illustrations indicate that if the things to be connected "belong" there is between them some sort of inherent bond, in the sense that the subject feels there is a certain fitness in connecting these things. This principle, which possesses something of both the nature and the vagueness of the Gestalt view, has been investigated or illustrated by some highly ingenious experiments. Certain of the aspects of belongingness are to be understood in terms of mindset, either habitual or temporary, while other aspects are related to meaning, though there appears to be more to the principle than either or both of these.

The concept of belongingness is employed by Thorndike to explain why, in the absence of after-effects, some acts or ideas frequently experienced in sequence are connected, albeit slowly, while other equally often experienced sequences are not connected. With the exception of the phenomenon of conditioning, mere frequency of occurrence of a sequence does nothing to establish a connection between the sequents, although frequency of experiencing a sequence *with belonging* may result in the learning of the sequence, though in the absence of after-effects such learning will be slow and inefficient. In *Human Learning*, Thorndike cites the following homely example to illustrate the ineffectiveness of mere temporal contiguity in forming bonds. "You practically always raise the body and bend it back after tying your shoes, and so have the sensations of bending the body back as a sequent to those of tying your shoes. You have done this from say 10,000 to 40,000 times (according to

your respective ages and predilections about changing your shoes often), but the experience of tying your shoes has probably never called to mind any sensation, image, or idea of the backward body-bend in one person in 1,000. Mere sequence with no fitness or belonging has done little or nothing" (pages 18-19).

IDENTIFIABILITY OF SITUATION AND AVAILABILITY OF RESPONSE

Two other major concepts introduced—identifiability of the situation and availability of the response—are important contributions to clear thinking about learning. Learning as a whole, Thorndike maintains, includes changes in the identifiability of situations and in the ease with which the response is available or summonable at will, as well as changes in the connections between situations and responses. Some situations are difficult to identify because they are subtle features of the stimulating conditions or because they represent degrees of qualities which are difficult to distinguish from slightly different degrees of the same qualities. Through analysis, appropriate direction of attention, association or the use of mental scales, situations may be rendered more readily identifiable by training or experience. If the learner's difficulty—though he may be unaware of it—is in discriminating between a given situation and one or more rather similar situations calling for different responses, remedial efforts directed at perfecting the response will almost certainly be futile.

According to Thorndike's analysis, unavailability may be of various kinds or degrees. Some responses may not be summonable because voluntary control has never been established over the activity. For most of us ear-wiggling is an illustration in this category. In other instances, such as the singing of a note, the response may not be summonable with accuracy or certainty, while in some instances elements of the total response may be under control although the integrated response may not be available or dependable. The simplest and commonest case is where only a crude approximation to the desired response is at first available. Few experiments on availability are reported, but Thorndike states that in certain areas, such as the teaching of phonetics, considerable ingenuity has been shown in rendering desired responses more readily available through appropriate manipulation of the stimulating conditions. In *The Fundamentals of Learning* he sums up the situation with regard to identifiability

and availability as follows: "Any feature of a situation which the mind can grasp and segregate can, by repetition and reward, be connected as strongly as we wish with any response which the mind can summon. The scientific control of connection-forming with an identifiable situation and an available response involves only the straightforward application of the laws of belonging and effect. The procedures by which undifferentiated, confused, and elusive facts can be made stable and fit for the mind's use and by which greater availability can be attained in the case of movement, attitudes, and feelings, have been indicated, but they need and deserve much experimental study" (page 352).

Reminiscent of Thorndike's early studies of chicks when he was a graduate student working with James at Harvard, is the study *Reward and Punishment in Animal Learning* (1932). A series of six experiments with chicks was designed to provide data which would make possible direct comparisons of the effects of rewards and punishments upon animal behavior, with the findings secured in experiments using humans as subjects. In each of the six experiments a choice-chamber offered three different exits, one of which led to the food pen where the reward was "freedom, food and company for 60 seconds" while the other two alternatives resulted in punishment of thwarting or confinement. Details of the experiments were varied systematically so that light would be thrown on various aspects of the operation of punishments. The results of these investigations were in harmony with the studies of humans and indicated that rewarding a connection always strengthened it substantially, while punishing it weakened it little or not at all.

In a brief note in *Science* for February 10, 1933, Thorndike reported the discovery that rewards operated not only upon the connections which they immediately followed and to which they belonged, but that they also influenced slightly punished connections preceding or following the rewarded connections. Thorndike offered this as evidence for a completely independent proof of his revised law of effect, for, he argued, if it can be demonstrated that a reward can spread backward to influence somewhat a punished connection *preceding* the connection for which the reward was intended, there cannot be any further logical objection to the possibility of the reward acting backward to influence the connection to which it was directly attached.

THE SPREAD-OF-REWARD PHENOMENON

A more complete account of the phenomenon of the spread of reward was given later in *An Experimental Study of Rewards* (1933). Fifteen highly diverse experiments provided the data for analysis by the sequence-of-response technique described earlier in connection with the revision of the law of effect. Percentages of repetition were computed for punished connections preceding a rewarded connection by 1, 2, 3, or more steps (i.e., items), and for punished connections following a rewarded connection by 1, 2, 3, or more steps. Thorndike found that there was a regular gradient in each direction from the rewarded connection, the spread of the influence of the reward diminishing as one considered connections successively more remote from the rewarded connection up to a total of 3 or 4 steps, at which point the amount of spread approached zero. The available data indicate that the amount of spread depends more on the number of intervening connection-units than on the mere temporal separation of the particular connection being considered from the rewarded connection. Brandt[21] has made an extended study of this point and his work confirms and supplements Thorndike's conclusion.

Another important aspect of the significance of the spread-of-reward phenomenon lies in its potential use as a tool for further investigations of the manner in which after-effects operate upon the connections which they immediately follow. If properly exploited, the discovery of this spread phenomenon may well rank among the most important of Thorndike's contributions. It has not yet received the attention it deserves.

Contributions of Thorndike to the theory of learning in terms of the law of effect, identifiability of a situation and availability of response, belongingness of a stimulus to a response, and the like were quickly utilized by him in certain theoretical and practical applications. The primary theoretical application was made in the *Psychology of Wants, Interests, and Attitudes*, the practical application in *Adult Interests*. Thorndike demonstrates in the *Psychology of Wants, Interests, and Attitudes* that a want, interest, or attitude, an ideal or an appreciation, all other things

[21] Brandt, Hyman. *The Spread of the Influence of Reward to Bonds Remote in Sequence and Time*. Archives of Psychology, No. 180. Columbia University, New York, 1935.

being equal, is as susceptible of being learned or modified as is a fact, a skill, a generalization, or an application. By the utilization of his typical ingenious experiments, he shows that the processes of learning an appreciation, for instance, are very like those involved in the learning of a skill. These conclusions were then applied particularly in *Adult Interests* in two lucid chapters on the "Control of Interests," where he demonstrates that the teacher of adults (or any teacher for that matter) might utilize the known facts and principles about learning in directing and re-directing the less tangible but definitely significant features of a learning situation.

CHARACTERISTIC FEATURES

If one were to attempt to characterize the work which Thorndike has done on the psychology of learning during this period, the following features would deserve prominent mention. Practically all the studies undertaken were directed toward important problems in basic learning theory, and little or no attention was devoted to the specific learning problems peculiar to the separate school subjects.

The persistence of attack upon fruitful problems is a second feature of Thorndike's work in the psychology of learning. One or two exploratory experiments, often rather crude, were very frequently run to "try out" a new area, to follow up a hunch, or to confirm a reasonable inference from experiments directed to other problems. If these preliminary investigations indicated that the problem was worth attacking, and that with the time, money, and facilities available, satisfactory approximations to the true solution could be reached, then and only then would further experiments along the same lines be launched. Few of the experiments involved the use of any but the simplest apparatus or materials. Instead of depending on intricate apparatus set-ups for control of interfering variables, the same result was achieved by planning and executing a series of simpler experiments in which these extraneous factors were controlled in succession, rather than simultaneously. Once the main outlines of the solution were determined with reasonable accuracy, Thorndike would shift his interest to different problems, leaving to others the smaller joys of filling in details.

A third feature of Thorndike's work is that the majority of the activ-

ities learned were relatively simple and did not necessarily make demands upon higher thought processes. I believe that experimental time is the principal reason for the absence of experimental studies of complex processes. In typical Thorndikeian experiments each subject may be called upon to make from 200 to 500 or more responses in a one-hour experimental session. If the complexity of the task were increased so that each response took as little as two minutes, consider the difficulty of securing, say 400 responses (40 items, 10 trials each), from as few as 20 subjects. Even such an inadequate experiment would require some eight weeks of rather steady testing. Such an experiment is by no means impossible, but it is highly impracticable in terms of cost and time. That the higher and more complex processes will be found to follow the identical principles governing simpler processes, as Thorndike contends, is one of a small number of his "estimates" which I fear will not be verified when adequate data become available.

An almost equal interest in the theoretical and the practical aspects of problems, and the formulation of shrewd hypotheses and theories constitute a fourth important aspect of Thorndike's work. The hypotheses are characteristically of the "testable" variety which promote research ideas and give direction to coordinated research activity. His theories, though based on experimentally determined facts are not earth-bound by being too closely limited to the scope of the facts. Theories are subjected to careful experimental scrutiny and not the least reluctance is manifested in abandoning a theoretical position when new facts justify that action. Though Thorndike is most frequently thought of as an experimentalist, his theoretical contributions have had and continue to exert a profound influence upon psychology and education.

More difficult to describe or appraise are the contributions which Thorndike has made to the psychology of learning through his influence upon those who have been privileged to work with him. His magnificent intellect, his amazing capacity for work, his high standards of accomplishment for himself and others, his kindliness and good humor, his tolerance for all weaknesses except stupidity, his generosity in sharing credit, his devotion to the truth—all these have affected us, and are but a few of the reasons we think of him affectionately as "the Chief."

Psychology and the Social Order*

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During the past few years certain works of E. L. Thorndike have dealt more directly with the problems which belong properly to the domain of social sciences, as well as with their relations to one another in the phenomena that can be referred to, collectively, as social order and social universe. This article is written as a critical survey and appraisal of their place, meaning, and implications in and to the whole framework of the social disciplines.

The various aspects of humanity, together with their modes of expression and related consequences, do not constitute a cabinet of curiosities where every kind of thing has an assortment of its own, labeled with its exclusive characters, and scrupulously segregated from its sibs and their interrelations. The separation of all sciences, and those of man in particular, is a matter of convenience and not necessity, and the demarcations in their subject matter are statistical and not categorical. Dr. Thorndike deals with man, following Roger Ascham's *Scholemaster's* precept: "Know thyself: that is to say, learn to know what thou art able, fit, and apt unto, and follow that." The theme of Thorndike's discourse in his recent contributions is: *the benefit of sound people for a sound society.* He establishes a teacher-taught relationship, and takes up man as "You"—your individuality, original nature, abilities, wants, interests, attitudes, beliefs, and knowledge, ways of spending time and money, your leaders and their morals, your city, your social order, and your future. These, ac-

*I am indebted to Professor Irving Lorge of Columbia University and to Professor Pitirim A. Sorokin of Harvard University for suggestions and other help in preparation of this article, and to Professor Lorge and The Macmillan Company for the loan of the proofs of E. L. Thorndike's new volume, *Human Nature and the Social Order.* I am also grateful to Miss Louise Kampf, the librarian of Colorado College, for cooperation and service.

cording to Thorndike, constitute the major elements in the interaction between nature and nurture resulting in the phenomenon popularly spoken of as man, human individual, or person.

THE STUDY OF BELIEF

Intellectual craft unionism and armchair isolationism are growing more and more rampant in the social sciences, for in their concomitant pursuits of purity and objectivity and independence from each other, they limit the usefulness of their analytic tools and pile up increasingly vast congeries of undigested data and principles. "Teaching of Controversial Subjects,"[1,2] by Thorndike, appears to be very timely in this connection. Thorndike introduces the argument that in our educational system, particularly on the elementary level, we are usually confronted with the choice of teaching "what is demonstrably true" or of discussing freely and fairly "all problems of great importance." He believes that people are likely to mistake the customary and acceptable truths for the demonstrable and to overlook the fact that most, if not all, of our knowledge *can* be looked upon as probable, indicating that demonstrability of probable knowledge varies in certainty and importance. He feels that while a science of values and wants may be essential for demonstrable truths, it is imperative for the controversial issues. He maintains that schools should teach the students to weigh the evidence without being moved by it. The problems before the student, or before anybody for that matter, can be grouped for possible solutions under the headings of *Pro*, *Con*, and *Alt*(ernative), taking the quantitative probability for each group as the guiding principle. The consequences and importance of each subject to the individual or group in question should be used for weighting the emphasis in teaching, thus reducing in amount considerable controversial material from curricula. A basis for action furnished by the testimony of "two passionless detectives, John Probability and Richard Weighting System," could be substituted for the "sound and fury" usually attending controversial subjects. Thus science supersedes controversy, although mankind does not live by science alone. While

[1] "Teaching of Controversial Subjects." (Inglis Lecture.) Harvard University Press, 1937.

[2] See also Harold Laski, "The Duty of the Intellectual Now," *Harper's Magazine*, Vol. 180, pp. 70-79, December, 1939.

we may hope with Thorndike that men will increasingly substitute science for controversies, the existing evidence in everyday life suggests that the probability value of such hope cannot be high.

In the course of experiments on learning, Thorndike made certain observations on the natural history of belief, certitude, and knowledge, and presented the summary of his conclusions as "Primitive Forms of Belief and Knowledge."[3] The cases analyzed in this study concerned learning one *out of a number* of responses to a given situation as the *right one*, "the one to be cherished and used, the one which the person comes to believe in or know" as he believes or knows common facts (e.g., 9 plus 8 equal 17, or Columbus discovered America in 1492). The experiment involved reading each of forty words, asking the subject to respond by any number from one to ten and informing the subject by a predetermined arbitrary key whether he was "right" or "wrong" for each response. Thorndike assumes that the initial expectation, or person's belief, is equal to zero (and that it is immaterial whether the choice is from ten, six, or twenty numbers). The essential etiology of the acquisition of knowledge or of the formation of a belief, according to Thorndike, consists then in *word* (situation) evokes *number* (response), leading to *confirmation or negation* by "Right" or "Wrong." Thorndike maintains that the common opinion that actions, choices, and attitudes are consequences of images and ideas is essentially incorrect; that after a number of Situation→Response–Reward occurrences, a person will be surprised to hear *wrong*, and expects to hear *right* without any inner representation. This, according to Thorndike, is basic to belief formation. He indicates that there are individual differences in this matter: (1) that certain persons, A, B, C, and D, may act in a certain way without such inner representations, (2) while E and F may need these representations to act in the same way, and (3) G, H, I, and J may do the same thing before they have such representations as well as when they acquire them. He concludes that (1) belief arises as a by-product of the *confirming* reaction upon connections (the strengthening of S→R bonds is acquired not by mere repetition of S→R but through recurrence of S→R–*R* or situation to response plus reward), (2) negative after-effects are practically without power to weaken con-

[3] *Psychological Review*, Vol. 41, pp. 403-411, September, 1934.

nections, no matter how often repeated, and (3) that the confirming reaction (or reward) not only makes the connection stronger but, after a certain strength is reached, gives an attitude of security and optimism.

There are three inferences from this study of belief that are particularly significant for social sciences: (1) that learning depends more upon acceptance than it does upon rejection; (2) that the realm of knowledge in a person's experience is essentially one of cumulation and integration of positive experiences which is likely to owe its relative stability to the very fact of limiting his knowledge to affirmed elements in his experiences; and (3) that the individual differences in the inner representations may be very significant for social differentiation.

INDIVIDUAL DIFFERENCES

Thorndike's studies in heredity and environment led him to a series of related problems dealing with distribution of abilities and their affiliations with one another as well as with other elements in man's world.[4] In "Relation Between Intellect and Morality in Rulers," Thorndike and his associates rated 305 male members of the European royal families for intellect and morality[5] and then correlated the ratings. They maintained that the greatness in rulers was largely hereditary and that, on the whole, a great ruler tended to be a moral person. Since these findings were questioned by E. T. Krueger,[6] who argued that morals vary in form in time and place and that most of the recent ecological studies stress environment rather than heredity as the causative factor, it seems in order to comment on them as well as on Thorndike's findings in question. J. W. Boldyreff, with P. A. Sorokin, rated 149 Austrian, English, French, and Russian Kings and 256 Roman Catholic Popes for certain personality traits (including morality).[7] Later he rated the same Kings and Popes for ability, arriving at these conclusions, which also apply to Thorndike's inferences and to Krueger's remarks about them: (1)

[4] "Heredity and Environment," *Journal of Educational Psychology*, Vol. 29, pp. 161-166, March, 1938, was one of these studies; a sampling of more than 10,000 students showed remarkable weakness of environment as cause of difference of ability.

[5] *American Journal of Sociology*, Vol. 42, pp. 321-334, November, 1936; pp. 559-560, January, 1937.

[6] "The Relation Between Intellect and Morality in Rulers." *American Journal of Sociology*, Vol. 42, pp. 558-559, January, 1937.

[7] Cf. P. A. Sorokin, *Social and Cultural Dynamics*, Vol. I. G. Allen, London, 1938.

morality can be defined as conformity to the prevalent mores—thus its correlation with ability (measured as achievement in the same framework) is not only likely but inevitable; (2) whenever the intelligence of the rulers (especially if lesser rulers are included with the kings) deviates from its expectancy by its correlation with morality, we may take it as a definite danger signal for the society in question; and (3) it is quite true that morals change in form, as do words, but that does not mean that there are no ways of correlating what was said or written in the past with what is being said or written now; and, finally, (4) that industry and perseverance seem to be, on the whole, more significant than morals.

In "Relation of Earning Power to Age in Professional Workers Under Conditions of Nearly Free Competition,"[8] Thorndike, in collaboration with Woodyard, presented an analysis of the salaries of the Methodist clergymen who lived to seventy or beyond, indicating the high competitive nature of the job in question and the wide range of abilities needed for success, and finding that "the prime of life is not a mountain, but a plateau," and that systems for promotion and retirement based on age are likely to be unfair to many, in consideration of the large individual differences among persons. In the companion investigation, "Effect of Violent Price-Fluctuations Upon Salaries of Clergymen,"[9] Thorndike and Woodyard found that, taking price fluctuations between 1860 and 1920 and comparing them with corresponding changes in the salaries of Methodist clergymen, on the whole the violent price fluctuations profited the clergymen. Their salaries increased more with sudden price rises and decreased less with sudden price drops. This finding questions the validity of the usually accepted doctrine in labor economics that wages lag behind prices, so that, on the whole, wage-earners lose as the result of changes in price levels.

In "Science and Values,"[10] Thorndike indicates that values are as much the subject matter of science as anything else, being distinguished from other judgments of fact only by two characteristics: (1) their concern with consequences, and (2) their affiliations with one another and with human characteristics. Values are important for the progress of science

[8] *Journal of the American Statistical Association*, Vol. 21, pp. 293-309, September, 1926.
[9] *Journal of the American Statistical Association*, Vol. 22, pp. 66-74, March, 1927.
[10] *Science*, Vol. 83, pp. 1-8, January 3, 1936.

and for the scientific point of view in general to the extent that they reanimate the flagging initiative in the discouraged social scientists and shoo off from the valueless-objective perch the methodological fence-sitters and epistemological Simon-pures.

DIFFERENCES BETWEEN CITIES

In *Your City*[11] Thorndike sums up a series of researches dealing with various phases and features of city life and their interrelationships. The problem of individual differences between cities forms the opening wedge in these quantitative analyses; Thorndike finds that in every feature, cities differ widely. He gives convincing diagrams of per capita variations in "persons 16 or 17 years old who were in school in 1930," frequencies of four creature comforts (gas, electricity, telephone, and radio), deaths during the first year of life, deaths from typhoid fever, and the like. The variation appears to be continuous.

After studying and experimenting with the 300 characteristic traits for 310 cities, Thorndike selected 35 traits, which he believes would be regarded by all reasonable persons as significant for the goodness of life for good people in a city. Of these, four concern *health;* eight concern the *educational opportunity* provided by the public; eight concern *economic and social items* like infrequencies of extreme poverty, and the amount of support of the local Y. M. C. A.; five items concern *creature comforts;* four concern *literacy;* and the remaining six items are taken as *evidence of good conditions* like the infrequencies of deaths from syphilis, homicide, and auto accidents, the value of the city's property in schools, libraries, museums, parks, etc.

Thorndike is willing to grant that his list of traits is far from complete, that in many respects it is relevant only to the present cities and not to comparisons between cities of the present and of the past. He adds, however, that this list would work cross-sectionally for any period and that if the other items were available their ratings would correlate positively with those he has chosen. Applying these scales to the individual cities, Thorndike finds that good traits seem to go together and that a city which is *very high* in certain of these items is likely to be above average in all other items.

[11] *Your City*. Harcourt, Brace, and Company, New York, 1939.

In trying to allocate the causes of the general goodness of life (G) in 310 cities, Thorndike considers the scores of ten cities high in G and those of ten low in G, to determine which of the 37 traits *seem* to indicate causal dependence on G.

To the question, what makes a city good, he answered tentatively that it was wealth, income, and personnel. In accounting for the differences in the goodness of life in these cities wealth and income contribute to the extent of 26.5 per cent.

Taking eleven items indicative of personal qualities (like the number of persons graduating from public high schools, the percentage of literacy in the total population, the excess of the number of physicians, trained nurses, and teachers over the number of male domestic servants), Thorndike developed his P score. Its correlation, for 200 cities, with G was plus 0.69, which indicated that 43 per cent of variation in G is attributable to variations in P. Income and personal qualities, together, account for 74 per cent of the variation in general goodness. His general conclusion for 200 cities is that in this country, cities are made better than others first and chiefly by having good people, and secondarily by having high incomes.

A rather complete summary of Thorndike's findings on city life, its goodness and relation to income and personal qualities of its people, would indicate that few of these facts were studied in this way before. Many may object to the general method of attack and the interpretation of the facts gathered, but the facts themselves cannot be questioned. The first and foremost objection may be to the generalization "good life for good people," both as a concept and as a measure of social value. "Good and bad," some will say, "are subjective terms. The works of Sumner and others indicate that morals change in time and space and that good life and good people are elusive ideas." I have no quarrel with Thorndike's G for, in the first place, all the elements that enter into its composition are quantitatively ascertainable, since on formal-logical grounds a definition merely "involves the selection of known referents as starting points, and the identification of the definiendum by its connection with these:"[12] and, in the second place, if we follow Husserl and

[12] Ogden, C. K. and Richards, I. A. *The Meaning of Meaning*, p. 387. Harcourt, Brace, and Company, New York, 1923.

Peirce and look into *Bedeutungsintentionen* and *erfuellte Bedeutungen*[13] or apply the test of practical consequences that "might conceivably result by necessity from the truth"[14] of *good life for good people*, we shall discover that the meaning conferring element is satisfied by the quantitative factors in G and that its consequential validity has been long established in a parallel argument by Spinoza (*Tractatus Politicus*) and by Hume (*An Enquiry Concerning Human Understanding*), where it was shown that the properties of human nature are just as valid conceptually and operatively as those of chemical and physical bodies.

Another sustained objection may be made to the general insistence on the possibility and advisability of constructive social planning. Much of the existing confusion concerning social planning was due, as J. S. Davis pointed out,[15] to the lack of a link between statistics and human engineering. It is hoped that Thorndike's city investigations will put a quietus both on the planless blunderers and the blundering planners, and the intellectual boondoggler and the theoretical Palinurus.[16]

It is unfortunate that Thorndike finds it necessary to insist too much on the universal validity of his goodness of life scales in *all their present detail*. The relative weights must vary in time and place and the individual items may fluctuate both in content and number. It may be said that his finding that good traits seem to go together may mean, among other things, that our current culture is efficient in getting its demands filled and that this association is a product both of the individual and the social factors.

Thorndike's findings on equality and disparity of incomes are very significant for social scientists and even more so for other practical modifiers of our socio-economic mores in view of the fact that the Schmoller-Pareto principle as to natural persistence of inequality has been lately rectified by numerous careful statistical investigations.[17] Since there

[13] Husserl, E. G. *Philosophie der Arithmetik: psychologische und logische Untersuchungen*, Vol. II, Part 1, p. 38. Halle-Saale, 1891.

[14] Peirce, Charles S. *Collected Papers*, Vol. 3, Sec. 457; Vol. 5, Sec. 9. Harvard University Press, 1931. See also Bertrand Russell, *Our Knowledge of the External World*, p. 142. London, 1914.

[15] "Statistics and Social Engineering," *Journal of the American Statistical Association*, Vol. 32, pp. 1-7, March, 1937.

[16] Virgil, *Aeneid*, B. III, 201-202.

[17] C. Bresciani-Turroni, "Annual Survey of Statistical Data: Pareto's Law and the Index of Inequality of Incomes," *Econometrica*, Vol. 7, pp. 107-133, 1939.

seems to be no harm from income inequalities and, moreover, since these tend to be fixed, one may seriously question the social good that is likely to follow out of experiments in altering distribution of wealth and income in the existing socio-economic order.[18]

All in all, Thorndike's city studies point to a new phase in our urban sociology and economics and with some minor qualifications their findings will be accepted and integrated into the socio-economic science.[19] The history of the urban researches [20] can be briefly, and very roughly, summed up, starting with the utopian and philosophical phase (Plato, Aristotle, More, Bacon, Andreä, Raleigh, Campanella, Stow, Botero, Fourier, Bellamy, Herzl, etc.), followed by the religious phase (St. Augustine, and the Kitezh Town and the Holy Grail concepts), then merging into the historical-developmental, literary-characterological-typological, travelogues-explorations, revelational-denunciatory, case studies, ecological-zones researches, regional investigations, etc., etc., etc. The notable feature of all these contributions is their invariable tendency to overlap in method, in sources of data, and their treatment, with *Civitas Dei* hobnobbing with *Civitas Terrena*, and sins of the cities playing ball with their virtues in a semblance of some sort of jigsaw-puzzle integration. This is said not entirely in detriment, for many valuable hints for

[18] Cf. W. L. Crum, "Regional Diversity of Income Distribution," *American Journal of Sociology*, Vol. 42, September, 1936, pp. 215-225; and the papers of H. Mendershausen ("On the Measurement of the Degree of Inequality of Income Distributions"), J. Marschak ("Individual and National Income and Consumption"), and H. T. Davis ("Relationships Between the Distribution of Income and Total Real Income") given at the Fifth Annual Research Conference on Economics and Statistics, Cowles Commission, Colorado Springs, Colorado, in 1939. The results of Marschak and Mendershausen should be taken with great caution since they have a persistent habit of assuming randomness whenever they cannot get the requisite statistics.

[19] Richard M. Hurd's figures for Urban Land Values about 1900 show such tremendous difference from Thorndike's 13 per cent range that one cannot help wondering whether one of the two is a passing manifestation; see Hurd's "The Distribution of Urban Land Values," *Yale Review*, August, 1902. One more point needs further verification; it is possible that besides the residential and other types of suburbs studied by Thorndike, there may be certain other kinds that he did not come across in his sample; e.g., H. H. Harlan in *Zion Town*, University of Virginia Publication, 1935, gives a picture of an entirely different suburb from any one of Thorndike's.

[20] The stage ordering has its pluses and minuses, the latter consist in the fact that stages or periods overlap; those interested in topology of time can read a sermon on the methodological time, a new species.

future studies lie slumbering in these tomes devoted to varying kinds of evidence and judgments as to

> . . . how wide the limits stand
> Between a splendid and a happy land.

It is rather a sobering feeling to realize, on completing a survey of the existing literature on city life, that up to very recent times there was only one really outstanding study on urban mores of man that gave actually a fairly full and comprehensive account. I refer to F. de Coulange's *Ancient City*.

Thorndike's *Your City* attempts the same for the Modern City. Although in some ways it falls short of de Coulange's inclusiveness and interpretation, in other ways it surpasses his contribution, particularly in the verifiability and the reliability of the data. The so-called qualitative aspects of city life, its "soul" and what not, are to some extent covered by Thorndike's P. I am sure that Thorndike would agree that the scale of personal qualities could be extended to include such and similar items. No doubt, as soon as the pertinent data are gathered, as, for instance, the intelligence scores for adequate samples of the population in the 310 of Thorndike's cities or some representative section of this universe, they will be incorporated in the P composites.

During the last few years, drawing largely on the alleged qualitative characteristics of the modern city, various imaginative writers harking back to Baudelaire, or Rimbaud, or Marx, tried to build up a case for urban degeneration and to explain it either in terms of cultural collapse,[21] social-economic rotting away,[22] American crude selfishness,[23] or some unpleasant mixture of these three.[24] It will be a great relief to constructive social scientists to find that Thorndike's data completely refute all these claims. His city studies give us, among other things, the concepts of Good and Bad City, together with blueprints for *attainable progress*—and a challenge to use these.[25]

[21] Spengler in *Decline of the West;* before him Geddes and after him Mumford.
[22] K. Radek in *Problems of Soviet Literature*, pp. 71-182. First Soviet Writers' Congress, 1934. International Publishers, New York.
[23] Georges Duhamel. *America The Menace.* (Trans. by Charles Miner Thompson.) Houghton Mifflin Co., New York, 1931.
[24] Henry Miller. *The Tropic of Cancer.* The Obelisk Press, Paris, 1935.
[25] Cf. *Time Magazine*, "Big Chief's GG," Vol. 30, pp. 25-26, December 13, 1937.

HUMAN NATURE AND THE SOCIAL ORDER

Human Nature and the Social Order[26] brings together all the pertinent facts collected by Thorndike and his associates, as well as by other present and past scientific workers, and we can find incorporated there in a flexible, logical framework much of the evidence previously brought out in *Original Human Nature*, in *Individuality*, in *Fundamentals of Learning*, in *Psychology of Wants, Interests, and Attitudes*, and much of the material not hitherto presented. It would be indeed presumptuous to attempt to give a hasty summary of this well-knit and tersely presented volume of some one thousand pages. Since the book has not yet been widely read, it may be profitable to indicate some of its major highlights and evaluate it as a whole and on the basis of its significance and place in the steadily accumulating social data and their systems. With this book E. L. Thorndike makes his formal and definitive debut as a full-fledged social scientist and philosopher, and we can no longer look at him as a casual contributor to our special provinces. It is important to stress this point for the sentiment of intellectual craft unionism is very strong in the social sciences, and it is customary among us to look askance at the contribution of "outsiders" and to forget in our professionalism that some of the more significant contributors came to our field by very indirect routes (e.g., LePlay and Pareto were engineers, H. Spencer not even a professional man, MacIver a specialist in political science, Sorokin a jurist, to mention a few instances).

Human Nature and the Social Order is divided into two parts; Part One: "General Facts and Principles," about 400 pages; and Part Two: "Special Facts, Principles, and Applications," about 570 pages. In the first part, Thorndike starts with the original human nature (genes) and works down to the acquired and the environmental additions. He lays great stress on the original and the acquired human variability and the resulting wide ranges in the individuality of men, showing that the possible 3,000 kinds of man that he offered as an example in his *Individuality* can be extended almost indefinitely.

The general theory, of what he calls the ABC of human behavior, stresses the fact that recent preoccupations with holism and the wholes

[26] Published by The Macmillan Company.

in situation, response, and person were perhaps carried too far; that, in actual investigations, science studies only elements in each case and never the wholes. He shows that taking these elements and listing all the

$$S\text{ (ituation)} \rightarrow R\text{ (esponse)} — R\text{ (eward)}$$

in a series, we may set up mathematics of human conduct and by extending our information about man be fully in position to make accurate predictions about his conduct.

Thorndike's treatment of *confirming reaction* will be of great interest to the psychoanalytic school, for it furnishes much behavoristic content to the rather loose *censor* principle of the Freudians and others. The differentiation between *conditional reflex* as against the *associative shift* is timely, and may solve the difficulty that we all have in making the transition from the evidence of conditioning to the experience of reacting.

His contentions in regard to abilities are as follows: (1) abilities tend to go together, (2) all abilities are specific (i.e., strictly speaking, we have no executive, musical, money-making, managerial, etc., abilities but have many specific traits—components that make up any one of these), (3) abilities, on the whole, are largely due to genes, (4) while genius is not irrepressible, nevertheless extremely able men get to the top, and (5) society should make an inventory of all the available abilities and use each man accordingly. The first three of his statements appear to be backed up by an impressive array of evidence; however, there are too many exceptions to permit the acceptance of his point four, and as to his point five one should add that the consideration of the *comparative advantage* to the whole society must not be neglected.

His treatment of punishment and reward as instruments of individual and social control is penetrating and supported by steadily mounting evidence. We all know that in schools the *paidogogos* has long abanboned his old functioning as *paidotribes*, and we are beginning to realize that in business and politics an *entrepreneur* may turn into too much of an undertaker, in all the several senses of this word, through an excessive emphasis on fines and punishments.

Thorndike's investigations into the realm of custom and the familiar as against change and the novel fail to account for the ups and downs in

these phenomena as demonstrated in the works of W. G. Sumner, J. L. Lowes, F. Chambers, P. Ligeti, P. A. Sorokin, and others. No doubt custom has its value[27] and in some cases even the words of Hommel may ring true: "An ounce of custom outweighs a ton of reason." In most of our minor daily chores this principle would hold also but even there not always.

Thorndike's emphasis on heredity is a healthy antidote to the cumulating arguments by the proponents of the cultural base theory. His discussion of natural foundation for craving for approval by self (of self) and by others, and of kindliness are very provocative,[28] and moves one to paraphrase Pope's lines in the *Essay on Man:*

> Nature and Nurture link man's general frame,
> And make self-love and social be the same.

In his concluding chapters of Part One, Thorndike shows that judgments about value precede judgments about existence and lays down two rules for a science of values, the ranking by consequences and the appraisal by affiliations.

Landor, in his *Imaginary Conversations*, had Cicero express himself to the effect that:

> . . . Philosophy, quite pure, and totally abstracted from our appetites and passions, instead of serving us the better, would do us little or no good at all. We may receive so much light as not to see, and so much philosophy as to be worse than foolish.

C. S. Peirce went largely unheeded in his attempts to call the attention of philosophers to the necessity for distinguishing between the motives to action as against ideals of conduct.[29] And only a short while ago A. N. Whitehead succeeded in showing that importance is a generic notion

[27] Cf. Herodotus, Lib., III: 37-38; Heraclitus, *Diog. Laert.* B X, No. 7; Charron, *De La Sagesse*, B. I., Chap. XVI; A. V. Joch (Hommel), *Ueber Belohnung und Strafe*; Ferguson, *Moral and Political Science*, Vol. I, Part One, Chap. II; Pascal, *Thoughts*, Chaps. 6 and 25; etc.

For an opposite position one should consult F. H. Allport's *Institutional Behavior.*

[28] Of course, two of W. I. Thomas' four wishes, recognition and affection, are similar to Thorndike's. Cf. Hans Speir, "Honor and Social Structure," *Social Research*, February, 1935; and Reinhold Niebuhr, *An Interpretation of Christian Ethics*, New York, 1935.

[29] *Op. cit.*, Vol. I, Secs. 574-648.

and that terms, morality, logic, religion, art, etc., denote subordinate species.[30] Thorndike's treatment of value ties together all the previous strivings to order this realm of our existence. If he is not completely successful, he has at least laid down a solid foundation on which a science of values can be built. Altogether, his Chapter 14 is an admirable contribution to our sciences, and points the way to many important developments.

The last chapter in Part One deals with living by science. His contention is, however, along entirely different lines from Kierkegaard and, while essentially correct as far as he goes, is less satisfying, for he does not go far enough. Man does not live by science alone but is ruled by numerous forces which are completely unscientific in their essence. One of these is Faith, and it simply won't do to leave it out so long as the majority of men persist in being swayed by it. It is true that Thorndike does not leave it out entirely; on pages 143-151 he discusses *Desire for Life after Death* as one of several wants of man. In this rather unfortunate portion of the book, Thorndike confuses three kinds of belief and attempts to squeeze the manifestations of each into one and the same frame of reference. When St. Anselm remarks that "If you do not believe you will not experience, if you do not experience you will not understand," he is not talking in terms of everyday expectation, nor does he refer to a ratio of the favorable observed cases to all possible cases. The belief—acceptance of the world of faith is aptly summed by these words to Tertullian: . . . *mortuus est Dei Filius; prorsus credible est, quia ineptum est. Et Sepultus resurrexit; certum est, quia impossible est. Credo quia absurdum.* The expectation—acceptance of the man in the street arises through repetition of confirming reactions, just as Thorndike shows it in his work on "Primitive Belief"; however, it is also entirely different from the probability—acceptance of the mathematician which cannot be invalidated even by contradictory single cases.[31] The

[30] *Modes of Thought*, pp. 16ff; R. Demos, in a lecture on "Objectivity of Value" on October 30, 1933, at Harvard, had indicated some interesting parallels between aesthetic and ethical values.

[31] See in this connection: R. R. Marett, *Threshold of Religion*, p. 44; K. Okakura, *The Book of Tea*, p. 66; S. Freud, *Moses and Monotheism*, p. 22; *Bishop Berkeley, Discourse addressed to an infidel mathematician;* Aristotle, *De Anima*, III, 10: 433; A. A. Chuproff, *Essays on the Theory of Statistics*, etc.

rewards of "God hypothesis" and the punishments through "devil theory" are very effective means of social control and we do not have to demonstrate their validity in order to study them; there are several examples where such studies were carried out, those by Durkheim offering a striking example. Even in logic, as John Stuart Mill points out, one has to differentiate between conditioned empiricism and intuitional certainty,[32] and since our logics are alternative, we must not restrict ourselves to any one of them exclusively.

In Part Two, dealing with the special facts, principles, and their applications, Thorndike applies the findings of the first part to social work (or philanthropy as he prefers to call it), to the examination of various human goals (e.g., liberty, equality, fraternity), to the non-economic welfare of man present and future, to the distribution of wealth and income (and current theories about them), to economics, business, and their ethics, the psychologies of capital and labor, of ownership; to the psychology of the alternative systems to capitalism, to political science; to people as citizens, as producers, as consumers, as patriots; to law and its doctrines about human nature; to invention and future chances of man; in fact, to very many of the conceivable problems dealing with man, his original nature, his training and environment, and the order of things that he sets up to live in. In the space of this review, one cannot enter into point-by-point discussion of all and every one of these problems, especially when he cannot agree with much of the detail. However, this reviewer agrees with most of Thorndike's major contentions and feels that in spite of indicated shortcomings *Human Nature and the Social Order* is a very significant book.

The dull and unintelligent, it is true, will care very little for his method of presentation, for it often just stops short of being a challenge thrown into the teeth of ineptitude and sloth. The immature minds will find there a chance to grow through exercise, though they will resent his scientific trustee attitude. The too theoretical and the over practical will possibly find numerous causes for dissatisfaction; and those emotionally perturbed with the "transitional" aspect of our culture will hold Thorn-

[32] Cf. Peter Browne, *Procedure, Extent, and Limits of the Human Understanding;* Dean H. L. Mansel, Bampton Lectures; etc. Much useful material will be also found in works of the Byzantine logicians and in the more recent contributions of Vasilieff, Brouwer, Weyl, Hilbert, Lewis, and Sheffer.

dike to account for his vindication of the capitalistic system, not as a perfect order of things but as the best offered. In a sense, *Human Nature and the Social Order* supplements the analysis of the capitalist production of J. A. Schumpeter and the militant apology for our business system vigorously presented by Carl Snyder. But it needs to be said that this book of Thorndike's likewise supplements the works of H. Croly (*The Promise of American Life*) as well as all other writings in the so-called liberal tradition. For the only true liberalism is one where the specificability of the conditions for the application of *all* terms is vigorously and rigorously maintained in terms of the observable routines in the common experience. This also happens to be the definition of logical empiricism or critical common-senseism, if you like, and it does correspond essentially to the general spirit of Thorndike's work.

This writer feels that in the growing totalitarianism in our social sciences, the renewal of emphasis on the individual is a very healthy sign. He agrees with Thorndike that so-called scientific materialism of the Marxian fanatics is a sad mass of unresolved contradictions which cannot be accepted, not because of their lofty goals which in themselves are acceptable to all kind and charitable people but because they plan without reference to the nature of their material and are overhasty in rejecting what they do not understand. Our time, money, and energy are all associated in our life, and our institutions are merely reflections of our abilities and their applications. We should plan within our equipment, and the work of Thorndike is definitely a step in that direction.

"So teach us to number our days: that we may spend them in wisdom. . . ."—thus mankind usually reasons in time of threatening stress, although it is more useful to do that ahead of time. The work of Thorndike as sociologist suffers from an excess of hope and cheerful outlook—but these may be good faults in our day.

Thorndike's Contribution to the Psychology of Learning of Adults

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MUCH of Thorndike's research since 1925 has been concerned, either directly or indirectly, with the psychology of learning of adults. Noteworthy volumes reporting the significant results of his researches were *Adult Learning* (1928), *Adult Interests* (1935), and *The Psychology of Wants, Interests, and Attitudes* (1935). The first of these volumes, supported by a grant from the Carnegie Corporation upon recommendation of the American Association for Adult Education, provided the scientific basis of fact for the development of an adult pedagogy. Previous to 1925, much of the theory for adult pedagogy either was transferred from the known facts about learning established by studies of children, adolescents, or college students, or was based upon anecdotal evidence from the learning experiences of able and successful older men and women. Thorndike's *Adult Learning*, in a sense, was a pioneering effort to determine how and how much adults learn. He did not neglect the scattered facts about adult learning which were available, but used them to orient his researches to the newer aspects of his concern with the genetic approach to the study of man.

Summarizing the evidence on the learning ability of adults, Thorndike concluded that "on the whole, it seems reasonable to state the case concerning sheer modifiability as follows: The general tendency from all our experiments is for an inferiority of about 15 per cent as a result of 20 years from twenty-two on. Learning representing an approximation to sheer modifiability unaided by past learning shows considerably more

inferiority than this. Actual learning of such things as adults commonly have to learn shows considerably less" (*Adult Learning*, p. 106). Moreover, if the graph on "the general form of the curve of ability to learn in relation to age" be considered as a summary of all the evidence, the relative performance of successive five-year groups would be, taking ability at age 25 as 100 per cent; for age 5, 41 per cent; for age 10, 66 per cent; for age 15, 88 per cent; for age 20, 98 per cent; for age 25, 100 per cent; for age 30, 98 per cent; for age 35, 93 per cent; for age 40, 90 per cent; and for age 45, 85 per cent. The relative ability of adults, then, declines approximately less than one per cent per year from age 25 on.

Thorndike, however, is careful to point out that "ability to learn" is used "as if men could be measured in all sorts of learning and compared justly in respect of a total average ability to learn," basing such measurements upon "an unprejudiced sampling of different sorts of learning" (*Adult Learning*, p. 126). Later, in his *Adult Interests*, he indicates that although he "showed that ability to learn increased from early childhood to about age 25 and decreased gradually and slowly thereafter, about one per cent per year . . . , later investigations by Miles, Jones, and others make it probable that the decline in ability to learn from age 45 on to 70 is not much more rapid than this, so that a man of 65 may expect to learn at least half as much per hour as he could at 25 and more than he could at 8 or 10" (p. 2). It should be noted that in the quotation, Thorndike uses the concept "at least half as much per hour"—indicating that he is thinking of learning efficiency. His results concerning the ability to learn as a function of age deal primarily with *learning efficiency;* that is, the results give relative values for the amount produced per unit of time. In this sense, the curve of ability that he reported is more truly a curve of performance than a curve of capacity. From the theoretical point of view, the distinction between performance and ability is fundamental. Certainly performance is a function of ability. Nevertheless, variations in performance cannot be considered to be related perfectly to variations in ability. While Thorndike accepted the evidence concerning variations in learning performance as a first approximation to variation in learning ability, he has indicated clearly that his results summarize the evidence about the relative output per unit of time.

Many learning experiments yielding performance-measures-per-trial-or-per-time have been interpreted as evidence for learning, when such data represent evidence for learning ability plus learning conditions, or for learning ability plus learning conditions plus condition of the learning. Lorge,[1] for example, has shown that if the condition of practice is changed from distributed practice (rest periods between trials) to massed practice (no rest periods between trials), the score is adversely affected. The score in each case represented a mixture of learning ability and the learning condition. In much the same way, in the chapter on "The Causes of the Age-Changes in Ability to Learn and in Amount Learned," Thorndike considers variations in amount occurring per unit-time as the result of the mutual interaction of endowment in terms of ability, maturation in terms of inner growth and degeneration, and environment in terms of training, practice, and disuse.

LEARNING AS ABILITY AND AS SPEED

Thorndike's experimental data, in general, confirm his hypothesis that persons will score differentially, depending upon their learning ability, their age (and what age means in terms of lowered visual acuity, lowered auditory acuity, increased reaction time, increased judgment errors, and the like), their previous experiences in learning, and their continuation with such learning activities as aging adults. It should be noted, however, that the kinds of learning activities that Thorndike utilizes generally lead to some measure per unit of time. For instance, in learning to write with the unpracticed hand, the gains in letters per minute after thirty practice periods of a half hour were 35 for the 20 to 25 year group, 32 for the 26 to 34 year group, and 18 for the group older than 35 years. In the same experiment, however, the gains in quality as measured by the Thorndike Handwriting Scale were +1.11, +0.96, and +1.16 for each of the three groups respectively. The amount-per-time score of letters per minute shows loss with increasing age; the quality score (or goodness of performance) shows no such decline. When the learning is measured in terms of goodness rather than quickness, the learning ability curve probably will not show as great a decline as would the curve of

[1] Lorge, Irving. *Influence of Regularly Interpolated Time Intervals Upon Subsequent Learning*, Section IX. Contributions to Education, No. 438. Bureau of Publications, Teachers College, Columbia University, New York, 1930.

learning efficiency. It is significant that the speed of reaction in terms of the swiftness of blow (in feet per second) slows down with increase in chronological age. From the data collected by Galton, Ruger and Stoessiger computed the average swiftness of blow for successive ages.[2] In terms of maximum swiftness at age 25, the relative speed for age 10 was 65 per cent; for age 15, 84 per cent; for age 20, 98 per cent; for age 25, 100 per cent; for age 30, 100 per cent; for age 35, 99 per cent; for age 40, 98 per cent; and for age 45, 96 per cent. Other studies by Nicholson, Marsh, Miles, Bellis, Walton, and Robertson confirm the general fact that speed of reaction declines with increasing age after 25 or 30. It is apparent that measures of performance, insofar as they involve some measure of speed of reaction, will penalize adults over the age of 30.

"LEARNING EFFICIENCY" AND "LEARNING ABILITY"

The confusion between "learning efficiency" and "learning ability" had already been considered by Thorndike in his *Measurement of Intelligence* as early as 1926. The confusion is not merely a distinction between the practical and the theoretical, it is a confusion in methods of measurement. It is a confusion of "trait purity" and "trait unity."[3]

If intelligence as measured by tests of intelligence be considered as symptomatic of "ability to learn," then a clearer distinction between *ability* and *efficiency* can be made. Thorndike stated in *Adult Learning* that "Almost nothing has been known concerning the curve of intelligence in relation to age from twenty on to forty-five" (p. 155) and argued from analogy that "We may then, in general plans for adult education, figure on a slight age loss in intelligence from twenty-two to forty-two, such as was found in the case of strength, speed, and skill" (p. 158). Just the same issue of speed versus power confuses the estimates of intelligence possessed by adults. Spearman, in 1927, asserted that mental ability as measured by *g* increases until it reaches maturity and "Thereafter, it normally retains this maximum level unaltered right up to the end of life. . . ."[4]

[2] Ruger, Henry A. and Stoessiger, Brenda. "On the Growth Curves of Certain Characters in Man (Males)" *Annals of Eugenics*, Vol. II, Parts 1 and 2, April, 1927.
[3] Thorndike, E. L. "Unity or Purity in Traits and Tests." *Occupations*, Vol. 12, pp. 57-59, April, 1934.
[4] Spearman, Charles. *The Abilities of Man.* The Macmillan Company, London, 1927.

Spearman's *g* is an estimate of unitary mental power. Fortunately, Thorndike's I.E.R. Intelligence Scale CAVD *is* such a measure of *g*,[5] whereas most other tests of intelligence measure unspecified mixtures of *g* (mental power) and *s* (speed). Lorge, using groups of different ages but equivalent mental power, found that on the Army Alpha, Otis Self-Administering, and like tests measuring an unspecified mixture of speed and power, the age group of 20 to 25 years made substantially higher scores than the age group of 27½ to 37½ years or the age group of 40 years and older.[6] Further, making estimates of loss in test scores from his data, Lorge applied the corrections to the data of Jones and Conrad, and Miles and Miles. The conclusion was that after adjustment, the data of Jones and Conrad "do not show the same gradual decline exhibited in their scores. The correction for the penalty of age, indeed, may be a correction for slowness, for remoteness from school, for disutility of function, for lack of motivation or for other physiological, educational, or psychological changes." After adjusting the Miles and Miles scores, it was found that "the correction for the penalty that a test of mental ability (which is an undifferentiated mixture of power and speed) places upon age changes the curve of mental decline to a curve of mental plateau. . .," substantially verifying Spearman's belief that *g* is unaltered in amount after maturity.

It may, therefore, be inferred that (insofar as power intelligence scores are *measures of learning ability*, and insofar as Thorndike's "ability to learn" is a *measure of learning efficiency*), the differences in relative status at successive ages between these measures represent differences in degree of maturation-degeneration, training-disuse, and interest-disinterest. It should be noted, however, that there may be differences in the way older adults learn as contrasted with the way younger adults learn. Thorndike has shown in his substitution experiments that "the older men retained what they learned a little better than the younger. They (the older men) were equally able to make use of an ability that transfers *positively* to help them with a second ability. They were less able than younger men to prevent or overcome hindrance by an ability that trans-

[5] Holzinger, Karl J. "Thorndike's CAVD is full of '*g*'." *Journal of Educational Psychology*, Vol. 22, 161-166, March, 1931.

[6] Lorge, Irving. "The Influence of the Test Upon the Nature of Decline as a Function of Age." *Journal of Educational Psychology*, Vol. 27, pp. 100-110, January, 1936.

fers *negatively*" (*Adult Learning*, p. 59). This result has been confirmed by Lorge[7] in subsequent experimentation.

The differential transfer effect may be due to the fact that older adults resist change, that they are less likely to modify interests, attitudes, or opinions. Thorndike has shown, by questionnaire analysis, that older adults are less likely to change their opinions or values than are younger adults.

Insofar as attitude scales can measure attitudes, the same fact was observed in a large group of adults tested by Lorge. He found that "the greater reliability and consistency of social attitudes of older adults tend to support the theory that a generalized attitude matrix may have been adopted as a frame of reference for social attitudes."[8]

Attitudes, as measured by the indorsement or rejection of opinion about social issues, are much more stable in older than in younger adults. This conclusion is "even more significant when it is considered that, in general, the attitude scales used in this study were calibrated on college youths in the age range 17 to 25 years." Stability of attitude may represent the difference in the kinds of learning in two different generations. The stability of attitude may be an "indication of resistance to change, or attitude crystallization" or it may be "forced by the necessity of adjusting to the environment."[9]

From the practical and educational point of view, however, the facts that Thorndike collected about learning efficiency are the kind that are directly usable by teachers of adults, who are, after all, more concerned

[7] Lorge, Irving. "'Confusion' as an Aspect of the Learning of Older Adults." *Psychological Bulletin*, July, 1935, 32, 559.

[8] Lorge, Irving. "The Thurstone Attitude Scales: II. The Reliability and Consistency of Younger and Older Intellectual Peers." *Journal of Social Psychology*, Vol. 10, pp. 199-208, May, 1939.

[9] In this connection, Dr. Thorndike's two articles on the "Interests of Adults," Parts I and II, in the *Journal of Educational Psychology*, Vol. 26, pp. 401-410, and 497-507, are pertinent. In studying the intercorrelations among ratings of like and dislike for some seventeen *interests*, Thorndike found: "First, there is great specialization of interests. Second, such group factors as appear seem more related to characteristics of the situations responded to than to unitary 'traits' in the persons." But Thorndike discovered a tendency which he called "Gen. Like," an average or total tendency to enjoy—a sort of general optimism opposed to pessimism which in general influences ratings of interests. Insofar as "Gen. Like" is a genuine characteristic of individuals, it will operate on judgments in such way as to make for greater stability. Further research is necessary, of course, to determine whether "Gen. Like" is related to age.

with direct application than with subtleties of efficiency versus ability. Thorndike, with shrewd insight, states in his *Adult Learning:*

> The provision of opportunities whereby adults can learn those things which they are able to learn and which is for the common good that they should learn is a safe philanthropy and a productive investment for the nation. When, on the other hand, wily advertisements or overenthusiastic propaganda seduce persons to enroll in courses for which they lack capacity, or interest, or both, there is sure to be waste and disappointment. Age, in itself, is a minor factor in either success or failure. Capacity, interest, energy, and time are the essentials (pp. 178-179).

And again:

> The interest in learning probably often suffers in adult years because the adult tries to speed up the learning and so undergoes more and greater strains and thwartings than does the more leisurely learning of childhood and youth. A child, for example, spends perhaps five thousand hours in learning to understand and use oral English. If, as an adult, he tries to learn to understand and speak German or Russian, he probably tries to proceed at five times as fast a rate. A college student, highly selected for intelligence, spends perhaps three hundred hours in acquiring a few very simple concepts about the production, distribution, and consumption of wealth. If he takes up economics as an adult, he allows less than half as much time for a similar achievement. Common practice is perversely inconsistent in this matter. It assumes that the ability to learn declines in adult years, but assigns longer or harder tasks per unit of time available for learning (p. 153).

LEARNING AND INTELLECT

Thorndike, in general, maintains that the level of a task that can be learned will depend upon the altitude of intellect. He argues that opportunities for the higher level of learning tasks should be given to those who can profitably use them. For instance, in "The Distribution of Education" he asks:

> What shall we say of laws or customs which systematically and emphatically distribute the most schooling to those least able to get profit from it for themselves or for the community? Are they not intolerably unwise and unjust? Yet they have been very common. Thus a child of a certain age (say fourteen) is allowed to go to work if he has reached a certain advanced stage (say graduation from Grade VIII); but, if he has only reached Grade V, for example, he must be given more schooling. Of forty especially able boys, five

left school before they were fifteen; not one of the dull forty left at such an early age. We need laws to prevent greedy or perverse parents from depriving gifted children of schooling, not laws to force them to keep in school children who have neither the ability nor the interest to profit thereby.[10]

INTEREST AND LEARNING

The curve of learning efficiency, then, is certainly conditioned by age-changes in sensory functions and psychophysical functions (such as speed of reaction and judgment). The kind of task, and how much of it can be learned, is certainly a function of altitude of intellect. Yet, in addition, differences in attitude and interest may prevent people from learning or trying to learn. Thorndike tried to get an estimate of the changes of interest with age, to determine whether interests wax or wane with increasing age. With ingenuity, he devised a schedule of interests ranging from reading, through outdoor competitive games, through sheer idleness. These schedules were answered by his own college classmates, psychologists, teachers, and other groups. Thorndike clearly recognizes that such responses may in some measure be erroneous, since the units of the scale may lack comparability, or the meaning of the values assigned change with age, or the values become spuriously low or high through the operation of a personal "halo" of reference. Nevertheless, until better measures of interest can be developed, and until genetic studies of the change of interest with age be completed, Thorndike's findings must stand. He utilizes his results cautiously and practically, reporting in *Adult Interests* that "The decrease in the total volume of interest from the twenties to the fifties is thus slight and is restricted largely to physical activities. The interests most needed to support adult learning show no decrease. . . . In them there is no steady unavoidable decline, not even a drop of one per cent per year, such as is found for the ability to learn" (p. 12).

From the practical point of view, the interests that a person has at, let us say, age 25, will be symptomatic of his interests at ages 45, 55, and

[10] Thorndike, Edward L. "The Distribution of Education." *School Review*, Vol. 40, pp. 335-345, May, 1932.

This article describes one of the important outcomes of the study of Metropolitan Youth, inaugurated under a grant from the Commonwealth Fund, and currently supported by the Carnegie Corporation. More pertinent discussion will be found in *Prediction of Vocational Success*, Commonwealth Fund, 1934.

beyond. There are, moreover, considerable variations in amount and pattern of interests among adults. Such variations in amount, such individual differences, are amenable to modification.

LEARNING AND THE LAW OF EFFECT

The primary thesis of the *Adult Interests* is that "Interests can be modified. Experiments . . . show that likes and dislikes can be learned by adults as truly as names or dates. . . . Within the limitations set by the inherited nature of man and individual men, there can probably be sufficient modifications of wants, interests, and attitudes for the purposes of present-day adult education, if suitable forces are applied and suitable methods are used." He shows that "Interests and motives may then influence life in two ways: by predisposing a person beforehand to connect certain responses with certain situations and by modifying these connections when they have occurred. Interests and motives cause certain connections to occur, and also cause certain after-effects of connections to be satisfying."[11] Moreover, "A satisfying state of affairs exerts a strengthening influence without perfect relevance. This strengthening influence will operate on connections to which the satisfier does not in any logical sense belong" or ". . . even when we cannot make the subject aware of what the connection is that we are rewarding."[12]

Thus, interests, attitudes, and wants can be controlled by explicit or implicit selection through rewards (or by their biological equivalences in "satisfyingness"). As a matter of fact, Thorndike has demonstrated in *The Psychology of Wants, Interests, and Attitudes* as well as in *Adult Interests* that the facts concerning how humans and infra-humans learn which were established in *Fundamentals of Learning* operate to change interests and the like. In the *Fundamentals* he has shown (1) that mere repetition of a situation (S) does not cause adaptive learning, (2) that mere repetition of connections (S → R) in temporal association, in general, does not cause adaptive learning, (3) that if the situation belongs to the response, or the response to the situation but without after-effects of satisfaction or interest or confirmation, that the course of

[11] Edward L. Thorndike et al. *The Psychology of Wants, Interests, and Attitudes*, p. 47.

[12] *Ibid.*, p. 60 and p. 68. In this connection, see Lorge "Irrelevant Rewards in Animal Learning," *Journal of Comparative Psychology*, Vol. 21, pp. 105-128, 1936.

adaptive learning while developed, is slow, but (4) that repetition of connection with positive after-effects (rewards, or whatever biological tendencies correspond to a confirmation or an O.K. reaction in the subject) causes substantial and dependable learning, and (5) that the influence of a negative after-effect (punishment, annoyance, and the like) upon a connection to which it belongs does not directly, inevitably, or universally weaken the connection it follows. The fundamental development of the "law of effect" in 1932 and in 1933 [13] which showed that the consequence, or after-effect, upon a connection *can* and *does* work back upon a connection to strengthen or weaken it, but that a negative consequence is not equal and opposite in its influence to that of a positive after-effect, provided the *modus operandi* for the major experiments in control of interests, attitudes, appreciations, and wants.

It should be pointed out that Thorndike does not reject punishment as a force for learning. He still believes that it may have some potency. He states clearly that the influence of a reward or a punishment depends upon what such after-effects cause the learner to do. He has demonstrated that the reward causes the connection to be confirmed in such way as to increase the probability of its repetition or continuance, whereas a punishment, more often than not, causes no tendency to discontinuance. Moreover, punishment in multi-response learning situations does not select the better or the right or even some other response. In this sense, punishment is an unreliable (albeit not impotent) force in learning. Punishments are potent for control insofar as they lead the person to engage in right or preferred behaviors, immediately rewarded.

In the *Fundamentals of Learning* he develops, in addition, two new principles—one on the identifiability of situations and the other on availability of response, stating "Connections are easy to form in proportion as the situation is identifiable, distinguishable from others, such that the neurones can grasp and hold and do something with it or to it. . . . Much of learning consists in changes in the identifiability of

It should be pointed out here that the inspiration and guidance of Dr. Thorndike has both directly and indirectly influenced the planning of most of the experiments reported by Lorge. By far the great majority of them were fully discussed with him from beginning to end. His enthusiasm and insight are so deeply embodied in these studies that they are, in large measure, Thorndike.

[13] Edward L. Thorndike. *An Experimental Study of Rewards.*

situations. Their identifiability may be increased by analysis which turns them into compounds or complexes of features which are easier for the mind to grasp and retain than the original situations. . . ." and "Other things being equal, connections are easier to form in proportion as the response is available, summonable, such that a person can have it, or make it at will."

"Much of learning consists in making certain responses more available, more easily summonable" (pp. 343, 344, 345, 347). Utilizing the "law of effect" and the principles of identifiability of a situation, and the availability of a response, Thorndike demonstrates clearly that interests, appreciations, attitudes, and wants can be, and are, modifiable. He further shows that modification can occur by reducing dislike through repetition (so that the activity itself, or its consequence, or its expectations are changed), by adaptation of appropriate actions (so that the person acts *as if* he had some interest in the learning), by changing the character of the situation, by changing the mental set of the learner, by increasing the ability of the learner, and the like. The evidence is such as to lead to a ready acceptance of the fundamental doctrine of the modification of interests. Insofar as adequate attention is given to sound procedures of learning and teaching, attitudes, interests, and wants can be modified, and such modified tendencies utilized for subsequent learning.

All in all, then, Thorndike has provided a sound basis for an adult pedagogy. In general, he has demonstrated that the laws of human modifiability do not change with age. Procedures that are fundamentally sound in learning at ages 10 or 20 will be so at ages 30 or 40 and beyond.

Thorndike has provided the facts that bridge the gap between unconscious acceptance of child psychology and the anecdotal data of adult psychology. Utilization of such facts in terms of method will greatly enhance the teaching of adults and will contribute most significantly to the understanding of learning for all age groups. While more facts still are needed, Thorndike has provided the basis for an adult psychology and an adult pedagogy which will give the science, the community, and the individual control of the ways of behaving.

New Studies in Education

THE TEACHER'S DEPENDENCY LOAD*

This investigation is a study of the types of dependents supported by teachers—single and married, the teacher's attitude toward the responsibility, and his participation in professional and community activities.

The data were obtained from 775 questionnaires answered by teachers and other employees of secondary and elementary schools. The sampling represents a widespread geographical distribution—largely from urban areas. Questionnaires were distributed by members of Pi Lambda Theta, National Association for Women in Education, who explained the questionnaire and returned the completed, unsigned questionnaires to the investigator.

The pattern analysis treatment was used to determine the relationship between the dependents and other factors which might be associated with their dependency.

FINDINGS

All the married men teachers were found to be supporting dependents, as were 63 per cent of the married women, 52.1 per cent of the single women, and 33.3 per cent of the single men. The married men were, for the most part, totally supporting and living with their dependents, while 38 per cent of the single women teachers supporting dependents were not living with them. Three-fourths of the single women teachers were supporting partial dependents only, although 57 per cent of these teachers were helping to support two or more dependents. There was an overlapping in amounts expended for total and partial support. The amounts named by teachers as spent on partial dependents ranged from $25 to $1,000 and on total support from $100 to $1,800.

The types of dependents supported by the different groups of teachers are significant. Men teachers were most frequently found to be supporting wives or wives and children—dependents whom they had chosen. The greater number of the single women teachers who had dependents supported parents or siblings—dependents not always of the teacher's own choosing and who might have other equally close blood relations who will not share this responsibility. Married women teachers were found to be supporting husbands or children, and in some cases included the support of parents in their patterns of dependency.

A significant finding of the study is the information with regard to the attitudes of teachers toward their re-

* By Theresa P. Pyle, Ph.D. Teachers College, Columbia University, Contributions to Education, No. 782.

sponsibility for the support of dependents. The attitudes showing lack of satisfactions centered around the support of parents and to a lesser degree around the support of siblings—the two types of dependents found most frequently in the patterns of dependency of the single women teachers. The support of husband or wife and of children (except in the case of a few married women) was associated with attitudes such as, "I derive only pleasure from this responsibility" or "I am glad to be able to support them and make sacrifices to do it."

It was also found that teachers with dependents had a larger average number of professional activities than did teachers without dependents, and that single women teachers with dependents had a larger average number of community activities than did teachers without dependents.

CONCLUSIONS

The complexity of the factors involved in the dependency load makes it difficult to set any definite limits as to what does or does not constitute dependency. Allowances made for support of dependents should involve a thorough examination of each individual case with respect to amount of financial support given, the need of dependent, the cost of living in the community in which the teacher lives and in the community in which the dependent lives, the contribution of the dependent to the teacher, and the psychological factors involved in the support of the dependent.

It seems probable from these findings that teachers with dependents, whether men or women, married or single, should be considered special assets to the profession.

PERSONNEL ADMINISTRATION IN THREE NON-TEACHING SERVICES OF THE PUBLIC SCHOOLS*

SYSTEMATIC personnel procedures are being found valuable in general governmental administration and in business, but have received relatively slight recognition in school administration. This study of personnel administration in public school systems proposed the hypothesis that, within the varied complex of total administration, the situations which include desirable personnel procedures are most likely to be the situations revealing evidences of good performance. More specifically, the study undertook to determine whether or not approved personnel procedures in administration tend to be associated with evidences of adequate performance in (1) attendance service, (2) nursing service, and (3) secretarial service, in the elementary schools of twelve city school systems.

Basic assumptions underlying the entire study are that the schools, as interpreters of democracy, should use democratic methods in dealing with school employees, and that consequently the schools should be showing

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leadership in the field of employer-employee relations.

Check lists were prepared as a basis for judging adequacy of certain aspects of performance in each of the three services and adequacy of personnel procedures. The many items in the check list on personnel procedures were summarized under twenty-one principles, which were grouped under eight sections, as follows: (*a*) planning and leadership, (*b*) development of personnel resources, (*c*) classification and salary scheduling, (*d*) selection and appointment, (*e*) terms of employment, (*f*) distribution of personnel, (*g*) working conditions, and (*h*) appraisal and interpretation.

The check lists were applied in a series of field studies in the twelve cities selected for observation. Comparative ratings were given which made it possible to select the places which were either higher or lower than the average in carrying out each of the procedures observed.

FINDINGS

The evidence collected shows a positive relationship between adequacy of personnel administration and adequacy of performance, as measured by the methods used in this study, in three non-teaching services in twelve city school systems. The strength of relationship between number of high ratings on personnel procedures and number of high ratings on measures of performance is shown by coefficients of correlation of .47, .85, and .18, respectively, for attendance, nursing, and secretarial service. The relationship is more consistent when low ratings are compared, as shown by coefficients of .83, .73, and .80, respectively, for the three services. So far as the twelve systems visited are concerned, the relationships are positive for both high ratings and low ratings, for each of the three services. Two principles of personnel administration which show an especially clear-cut association with ratings on performance relate to (1) methods of selection of personnel and (2) provisions for adequate working space and equipment.

In no one of the cities visited was there evidence of a comprehensive program of personnel administration. Where progress was being made it was largely in terms of specific areas of service, or specific aspects of procedure. Steps had been taken to build up the health service, or the attendance department, but not the non-teaching staff as a whole. Or, efforts were being made to systematize functions or to develop greater employee participation in policy-forming, but not to improve the personnel program as a whole. Three causes which appeared to contribute to this neglect of personnel administration as it affects the non-teaching personnel were: the inadequate staff assistance available to superintendents, the failure of the superintendents to conceive of a broad program of personnel administration as one of their professional responsibilities, and the absence of research on certain crucial phases of personnel administration.

Experience and research findings both in school administration and in general governmental administration, as they relate to personnel, are summarized in the statement of principles of personnel administration which was used in the study. This statement, and the documentary sources cited, should be of value to superintendents of schools and personnel officers in local

school systems. It could be used as a check list by which to evaluate present practice and to plan for the development in a local school system of an adequate program of personnel administration for the non-teaching staff.

THE PURPOSES OF CHURCH-RELATED COLLEGES*

THE liberal arts college, perhaps more than any other institution of higher education in the United States, is under fire at the present time. The great majority of liberal arts colleges which are not a part of a university system are church-related institutions. The object of this study was: (1) to discover the purposes avowed by these church-related colleges in the past, and at the present time; (2) to delineate the trends and influences which have affected the aims of the colleges; (3) to critically examine these aims, and appraise them; (4) to propose a program for implementing the purpose deemed most suitable for meeting modern demands.

The investigation was limited to institutions enrolling fewer than 600 students. The methods of research used were essentially historical, survey or descriptive, and philosophical. An extensive and intensive examination of college catalogs, covering a period from 1860 to 1938, was made in order to discover trends in the purposes stated by the colleges. A check list containing 51 items, which had previously been tested and revised, was employed. This examination of published statements of purpose involved a study of 818 catalogs representing 260 different church-related colleges (198 Protestant, 62 Catholic), and also a group of 52 colleges not directly related to a church, which served as a comparative or Independent Group. In addition, an analysis was made of supplementary material (such as personal letters, annual reports, charters, and minutes of faculty meetings) received directly from 216 presidents of these colleges.

Besides the examination of purposes *explicitly* stated by the colleges, the study included an analysis of aims *implied* in curricula announced in the catalogs of the institutions. This part of the investigation was restricted to vocational aims implied in announced programs of study; an effort was made to compare the implied vocational aims with the explicitly declared purposes of the colleges.

FINDINGS AND RECOMMENDATIONS

On the basis of historical research it was found that, in general, there was a fair degree of unanimity concerning the aims of the church-related colleges, from the founding of Harvard until the time of the Civil War. Although there were undercurrents of a new era in higher education which would bring with it a confusion of purposes, prior to the Civil War an intense religious interest and a widespread belief in the doctrine of mental discipline narrowed the major institutional aims to the following: (1) preparation for the min-

* By LESLIE KARR PATTON, PH.D. Teachers College, Columbia University, Contributions to Education, No. 783.

istry, (2) preparation of leaders in civic affairs, (3) sharpening the intellect through mental discipline, (4) teaching religion and thereby "saving souls," (5) disciplining the students regarding conduct, and (6) inculcating culture through an emphasis on the classics.

The study of vocational aims implied in curricula announced by the colleges revealed 62 different occupational courses; teaching and business pursuits headed the list. Nine major institutional objectives emerged from a careful study of the catalogs and the material sent by the presidents. These were: (1) intellectual development, (2) the classical curriculum, (3) vocational preparation, (4) self-help plans; minimum expense for the student, (5) inculcation of doctrines of the related church, (6) service to the community, (7) citizenship and social problems, (8) attention to the individual, and (9) the development of Christian character.

The conclusion is reached that each of the major purposes which emerged from the data of this investigation has merit, and that certain circumstances may justify a church-related college in the adoption of any one or several of these objectives, or some other major purpose which did not appear in this study. There is need for clearer statement of the function of each type of higher educational institution; above all, the aim should be to conserve human resources. The writer maintains, however, that three of the major purposes which emerged from this study are peculiarly appropriate for the church-related college today. These three purposes are: attention to the individual, citizenship and social problems, and the development of Christian character.

The implications of these three major aims are interpreted in the light of criteria chosen for the appraisal of institutional purposes. These criteria take into account the broad problem of goals in education, the social-economic scene, the student, and the college.

What function can the church-related college perform better than other institutions of higher education today? The conclusion is reached that the special contribution which the college can make at this time may be found in an appropriate implementing of the aim which the study revealed was the predominant aim of 260 church-related institutions. In short, the development of Christian character which shall express itself through social leadership. It is not advocated that the college should teach techniques and minutiae in economics, in government, in the social sciences, but instead, that it should furnish its students with a sense of direction, with a sound basis for evaluation of social problems, with a faith in democratic processes. It is recommended that the church-related college confront its students with a fresh interpretation of the Christian frame of reference and the Christian perspective on life in terms of the area in which today there exists the greatest need—the area of human relationships.

Notes on Recent Conventions

EASTERN STATES ASSOCIATION OF PROFESSIONAL SCHOOLS FOR TEACHERS

The Eastern States Association of Professional Schools for Teachers held its fifteenth annual spring conference at the Hotel Pennsylvania in New York City, April 5, 6, and 7. This association is, as its name implies, a regional group of graduate and undergraduate schools or colleges of education of universities and state and municipal teachers colleges and normal schools. It is distinct from most educational associations in that students as well as administrative officers and faculty members are admitted to membership and in a wholesome and helpful way have "stolen the show."

The Conference began Thursday evening with a presentation by Dr. Ben D. Wood, professor of collegiate educational research at Columbia University, of "The Programs of the National Committee on Teacher Examinations of the American Council on Education." The plan was critically analyzed by Dr. W. A. Ackerman, formerly of the New Jersey State Department of Education, and sharply attacked by Dr. A. L. Rowland, president of the State Teachers College at Shippensburg, Pa., as an unfortunate step toward standardization of curricula for teachers and centralized regimentation. These criticisms, in the mind of most of the audience, were satisfactorily answered by Dr. Wood in rebuttal.

The Friday morning meeting of the administrative and instructional members considered the place of graduate work in the education of teachers. Dr. Hermann Cooper, Assistant State Commissioner of Education, Albany, N. Y., discussed "The Policies Underlying the Decision of the New York State Department of Education to Extend Certification Requirements for Secondary Teachers to Five Years by June 1, 1943," and Professor E. S. Evenden of Teachers College described "The Cooperative Program in Pre-service Teacher-Education at Columbia University." Discussion of the two papers was opened by President H. A. Sprague of the State Teachers College, Montclair, N. J., and President L. K. Ade of the State Teachers College, Mansfield, Pa. Considerable interest was manifested in the phases of the Columbia University plan that make possible a three-year professional program above the junior college curriculum.

The Friday morning meetings for the students from the participating institutions took the form of seven panel discussions—the panels composed of student delegates from six or eight different institutions and a designated faculty adviser from one institution. These student conferences were very well attended and participation was

active. The topics which the panels considered were: (1) the character and significance of general programs for the entire college; (2) problems of student cooperative government associations of colleges and universities; (3) the guidance we need; (4) student participation in the evaluation and enrichment of the college curriculum; (5) the teachers college program of social education; (6) the making, adoption, and audit of student activities budgets; and (7) student publications clinic. These panel conferences were summarized by the chairman or some selected student at the general student meeting Saturday morning.

The theme of the general meeting on Friday afternoon was "Youth Faces Its World." Dr. Floyd W. Reeves, director, American Youth Commission of the American Council on Education, opened the meeting with an address on "Youth in Crisis," which was followed by an address by Sanford Bates, executive director, Boys Clubs of America, on "What Youth Owe to Their Country." Dr. Reeves maintained that opportunities for young persons are not as good now as they were ten to twenty years ago and that opportunties to supply on a nation-wide basis employment, education, guidance, health instruction, and recreation for young men and women were being neglected. Sanford Bates, on the contrary, presented the view that it is possible to do too much for young people. Modern youth has the courage, ideals, and abilities to prepare for and, if necessary, make jobs, and it should not be denied the opportunity nor the challenge to do so. The discussion was opened by Dr. Alonzo G. Grace, Commissioner of Education for Connecticut.

The student-faculty banquet was held Friday evening. There were approximately one thousand in attendance. Students and faculty members from each institution were grouped at adjacent tables and enlivened the early part of the banquet with their college songs. Four groups of songs by the a cappella choir from the State Teachers College at Danbury, Conn., were enthusiastically received. Congressman Jerry Voorhis of California gave the address of the evening, "An American's Duty in the World of Today." He presented in a very sincere and effective way five duties of American citizens: to be sure to what they are giving allegiance; to keep their heads in a world at war; to resist the rising tide of prejudice; to prove that democracy will work; and to deepen their faith in the power of the spiritual. The evening's program was concluded with a dance.

Saturday morning was given over to the general summary meeting for the student groups and to a series of ten meetings for faculty members in the fields of: (1) art and music; (2) directors of personnel, deans of men, and deans of women; (3) education and psychology; (4) English; (5) laboratory schools; (6) librarians; (7) physical education and health; (8) rural education; (9) science; and (10) social science. Among the Teachers College staff members participating in these group meetings were: Professor Ray Faulkner, Miss Ethel M. Feagley, and Professor Gerald S. Craig.

Professor Florence B. Stratemeyer and some of her graduate students in Teachers College visited as faculty observers in the student conferences on Friday, and Professor Stratemeyer reported to the general student meeting on Saturday some of the values that she

and her observers had seen in the panel discussions, and offered some constructive suggestions for the improvement of these discussions in future meetings. It was very evident from the reports of the student meetings that the presence of the student members of the Association is not only one of its distinctive features but also one of its most valuable professional contributions. Professor Ambrose L. Suhrie of New York University received deserved recognition for his pioneer work with this phase of the Association's program.

President R. L. West, of the State Teachers College, Trenton, N. J., was elected president of the Association.

E. S. EVENDEN

NATIONAL CONFERENCE ON CONSUMER EDUCATION

The second National Conference on Consumer Education met at the Institute for Consumer Education, Stephens College, Columbia, Mo., April 1 to 3. "Making Consumer Education Effective" was the general topic for discussion.

The first session was devoted to a consideration of what labor, the Better Business Bureaus, and cooperatives are doing to further consumer education. The evening meeting dealt with the problem of advertising and what should be taught about it in the schools. Professor Harold Rugg of Teachers College discussed one side of the question. Douglas Taylor of Printers' Ink Publications, and C. H. Sandage, professor of marketing, Miami University, Oxford, Ohio, presented a somewhat different approach to the problem.

Tuesday morning and afternoon sessions were devoted to a series of round table discussions, ranging all the way from what we should teach in consumer education to the high school students, to the place of propaganda, labeling, and grading, and the relation of consumer education to business. In all, twenty-three round tables worked on various aspects of the problem. A special student panel, composed of students from fifteen Middle Western colleges and universities, carried on a spirited discussion regarding what college students think should be taught about their own consumer problems.

President James M. Wood of Stephens College presided at the dinner meeting Tuesday night, and Professor Harold F. Clark discussed the problem of "Vitalizing Economic Education." He dealt particularly with the necessity of basing economic education on the needs and interests of the students and adults concerned. This would mean, in most cases, that consumer problems would be the best approach in an effort to vitalize economic instruction.

The Wednesday morning session was devoted to finding out more about consumers themselves. A statement was made from the viewpoint of the retailer by David R. Craig, president of the American Retail Federation, Washington, D. C. Several other viewpoints were also presented. Malcolm S. MacLean, director of the General College, University of Minnesota, gave an enlightening and interesting summary of the various round tables. The last meeting Wednesday afternoon was presided over by Mr. Harold S. Sloan, executive director of the Alfred P. Sloan Foundation. Corwin Edwards, special assistant to the Attorney General of the United States, discussed the relation of consumers to monopoly

problems, and Professor Robert Brady of the University of California, discussed the effect of war upon American consumers.

HAROLD F. CLARK

MUSIC EDUCATORS NATIONAL CONFERENCE

The biennial meeting of the Music Educators National Conference, held in Los Angeles March 30 to April 5, was the first national meeting of the conference (which was organized thirty-three years ago in Keokuk, Iowa) to be held on the west coast. It was a gala occasion, proving a fitting follow-up of the celebration of the first hundred years of music in public education held in St. Louis in 1938.

The attendance of music educators exceeded ten thousand, while the aggregate of pupils brought in from all over the country for performances and demonstrations was near fifteen thousand.

The emphasis on public performance of highly trained bodies of students from the secondary schools has brought about an increase in the intensity of training, the volume of expert performers, and the geographical spread of such groups. As a result, in the opinion of many, the conference programs have reached a peak in size and complexity. These large-scale programs have tended in recent years to become bigger and better duplications of a type of orchestral and school performance which happens to be only *one* area of music education. In general recognition of this state of affairs, the resolutions committee, headed by Dean John W. Beattie of the Music School of Northwestern University, recommended a rethinking of those broader aspects of music education which aim toward increased musical opportunities for entire communities, both urban and rural, including both children and adults.

There was evidence of a reawakening of interest in the fundamental importance of the elementary school music program at one end of the scale and of teacher training at the other.

As usual, the atmosphere of the convention was enthusiastic, warmly friendly, and dynamic. Moreover, there seemed to be an unusually thoughtful and constructive attitude toward both administrative and educational problems.

The phenomenal growth of the conference during the past decade has necessitated a revision of the constitution, which has placed more responsibility on sectional, state, and local affiliations throughout the country. It is interesting to note that twenty years ago in Philadelphia, when the conference attendance was approaching two thousand, alarm was expressed at the increasing variety of interests which necessitated ten sectional meetings scattered throughout the week. The Los Angeles conference scheduled one hundred eighty-seven events, with frequently as many as ten concurrent meetings from which the ten thousand music educators could choose.

Another evidence of growth lies in the new policy of the conference yearbook, which is now making the transition from the usual book of proceedings to a monograph on significant aspects of music education today.

Now that music educators have proved the worth of their subject in an educational scheme dedicated to individual development and social betterment, they are ready as a group to

endorse the proposed affiliation of the Music Educators National Conference with the National Education Association. This awareness of the music teacher's responsibility for larger and more general problems did nothing, however, to dampen the ardor with which all sought specialized information and help. Clinics in voice, piano, band, and orchestra, many beginning at seven-thirty in the morning, drew enormous crowds.

A demonstration of music in the integrated program was given before a large audience by Professor Lilla Belle Pitts, who developed a lesson in the appreciation and interrelationship of poetry, painting, and music by leading a class of Los Angeles children through experience with significant examples of literature, art, and music.

A valuable clinic on vocal music developed the theme "Meeting the Singing Needs of Children in the Elementary Schools."

The philosophic and aesthetic aspects of the convention were reflected in such outstanding addresses as "The Arts and a Design for Living," by Dr. Albert S. Raubenheimer, Dean of the College of Letters, Arts, and Sciences at the University of Southern California; "The Spiritual Essence of Music," by Professor Henry Purmort Eames of Claremont College; and "Music and Personal Well-Being," by Dr. Eric T. Clarke of the American Association of Colleges.

An enjoyable feature of the conference was the Teachers College faculty and alumni dinner, at which a large group participated in a program planned by Dr. Lorin Wheelwright, director of School Music in Salt Lake City, with the able assistance of Miss Edith Hitchcock, president of the Southern California Junior College Music Association. Group singing was conducted by Professor Adolph Otterstein of San Jose State College. Mr. Fritz Heim of Horace Mann School played two violin solos, accompanied by Dr. Alton O'Steen of Ohio State University. Professor Lilla Belle Pitts and Professor Raymond Burrows described the reorganization of music education at Teachers College, emphasized the developments in methods courses and supervision of practice teaching, outlined the possibilities in the field of applied music, and told of the new plan of personal advisement for each music education student. In the ensuing discussion, the group expressed hearty approval of the new policies and asked for more details.

An unusual experience for those attending the conference from the East and Middle West was afforded by the private train bearing the name "Seminar Special," which took a group of eighty-five members to Los Angeles. Under the leadership of Mr. Glenn Gildersleeve, state director of music in Delaware and president of the Eastern Music Educators Conference, the group divided into sixteen small committees for a daily discussion hour. The plan promoted enjoyable social contacts as well as professional discourse. The findings of each committee, presented in sixteen brief summaries, provided one of the most interesting general sessions at the Los Angeles conference. Among the Teachers College members of the group were Professor Burrows, Miss Marion Flagg of Horace Mann School, who is a member of the Research Council of the M.E.N.C., and Mr. Heim.

LILLA BELLE PITTS
RAYMOND BURROWS

EASTERN ARTS ASSOCIATION CONVENTION

The thirty-first annual convention of the Eastern Arts Association, held in Philadelphia March 27 to 30, brought to the attention of approximately nine hundred educators interested in the arts new developments in the field. In recent years there has been an increasing tendency to present outstanding artists at such conventions. This year Lazlo Moholy-Nagy, formerly of the Bauhaus in Dessau, Germany, discussed some of the teaching methods developed by that group; Mr. Arthur C. Holden discussed housing and community arts; Miss Virginia Hammill, interior decoration editor of *The Woman's Home Companion*, discussed the designer's part in industry; and Mrs. Vanderbilt Webb, president of the Handicraft League, emphasized the relationship of handicraft movements to sound business procedures. Other meetings along similar lines presented contemporary practices in cartoons and cartooning; the designing and making of stained glass; Pennsylvania Dutch Arts; and scientific aids to connoisseurship.

Dr. Alexander J. Stoddard discussed democracy in education with particular reference to art, and conference discussions on the theme "The Place of Art Education in American Life" centered around three desirable areas of service: stimulating the creative art spirit in every individual; providing for the growth of individuals in their experience and appreciation of the arts; and promoting and fostering art in all its forms in the enrichment of American community life. This tendency to regard as important the art which exists in American communities is a step forward on the road to vital art teaching.

Receptions were held in the Philadelphia Museum of Art, where visitors saw the recently opened Chinese Collection, and at the Philadelphia Art Alliance, where they saw an exhibition of paintings unique in having been selected by a jury of prominent business and professional men, the idea being to show the type of paintings the layman prefers. Four tours were organized to visit historical colonial houses in Fairmount Park, Colonial churches and buildings, the art galleries and museums, and outstanding public schools.

Two items were of special interest. The first was the excellent series of traveling exhibitions prepared by members of the Eastern Arts Association. These exhibits, emphasizing the many ways in which art permeates all phases of community life are to be circulated among the schools during the coming year. The second was the extensive work done by the Committee on Research in Art Education in bringing to light the many phases of this field in which research has been done and needs to be done.

The gold award for "long and distinguished service in the field of art education" was awarded to Mr. Forest Grant, director of art, New York City schools.

Mr. Elmer A. Stephan, director of art in the Pittsburgh, Pa., public schools was elected president of the Eastern Arts Association for 1940-41 and Mr. Vincent A. Roy of Pratt Institute was elected vice-president.

RAY FAULKNER

College and Alumni Notes

BOARD OF TRUSTEES OF TEACHERS COLLEGE

At the meeting of the Executive Committee of the Board of Trustees of Teachers College which was held on Friday, April 5, the following action was taken.

Promotions were approved as follows: Helen M. Walker, Ph.D., from Associate Professor to Professor of Education; Ruth Strang, Ph.D., from Associate Professor to Professor of Education; George W. Hartmann, Ph.D., from Associate Professor to Professor of Education; Hamden L. Forkner, Ph.D., from Associate Professor to Professor of Education. Jean Betzner, Ph.D., from Assistant Professor to Associate Professor of Education; Wilbur C. Hallenbeck, Ph.D., from Assistant Professor to Associate Professor of Education; Robert L. Thorndike, Ph.D., from Assistant Professor to Associate Professor of Education; Ernest G. Osborne, Ph.D., from Assistant Professor to Associate Professor of Education. Gertrude Driscoll, Ph.D., from Associate in Child Guidance in Teachers College and Guidance Specialist and Research Associate in Lincoln School, to Assistant Professor of Education; Harry R. Wilson, Ed.D., from Associate in Music and Music Education to Assistant Professor of Music Education; Edwin Ziegfeld, M.L.A., from Instructor in Fine Arts and Fine Arts Education, to Assistant Professor of Fine Arts.

The following appointments to the rank of Professor Emeritus were approved: Professor Edward L. Thorndike, Ph.D., LL.D., Sc.D., as Professor Emeritus of Education, from and after July 1, 1940; Professor Anna M. Cooley, B.S., as Professor Emeritus of Household Arts Education, from and after July 1, 1941 with leave of absence for the Academic Year 1940-41; Professor Cora M. Winchell, A.M., as Professor Emeritus of Household Arts Education, from and after February 1, 1941, with leave of absence for the Winter Session of 1940-41; Professor Mary S. Rose, Ph.D., as Professor Emeritus of Nutrition, from and after July 1, 1941, with leave of absence for the Academic Year 1940-41. Professor Jesse F. Williams, M.D., Sc.D., as Professor Emeritus of Physical Education, from and after July 1, 1941, with leave of absence for the Academic Year 1940-41.

Miss Margaret E. Bennett, Ed.D., Director of the Guidance Department of the Pasadena City Schools, was appointed Visiting Assistant Professor of Education for the Academic Year 1940-41.

Professor Roy N. Anderson, Ph.D., was granted a leave of absence for the Academic Year 1940-41.

INSTITUTE OF EDUCATIONAL RESEARCH

Division of Field Studies

The field work of the survey of the public schools of Pittsburgh, Pa., has been completed. Thirty-five members of the faculty of Teachers College, seven research assistants, and sixty-five advanced graduate students participated in the inquiry. To coordinate the work of the divisions of the survey a seminar was held once a week at which reports were discussed by faculty and students. During the week of April 7 Professors George D. Strayer, N. L. Engelhardt, Jesse H. Newlon, John K. Norton, W. S. Elsbree, H. L. Caswell, L. Thomas Hopkins, H. B. Bruner, Ruth Strang, Edwin A. Lee, and W. C. Hallenbeck and Dr. Henry H. Linn, representing the major divisions of the survey, conferred with the administrative and supervisory officers and the principals of schools in Pittsburgh. The tentative findings of the study were presented and many of the major recommendations reviewed. The final report will be presented to the Board of Education in Pittsburgh on May 23.

DIVISION I
FOUNDATIONS OF EDUCATION

Social and Philosophical Foundations

Professor Edmund deS. Brunner was a member of the Population Round Table of the eighteenth annual conference of the Milbank Foundation held in New York City on April 2 and 3. He opened the discussion on "Implications of Population Trends for Education."

The February issue of *The Review of Educational Research*, which is devoted to "The Social Backgrounds of Education," was prepared under the chairmanship of Professor Brunner, who contributed one part of the publication. Professors Harold F. Clark and Wilbur C. Hallenbeck each contributed one of the four parts.

The College Charts Its Course, by Professor R. Freeman Butts, is included in the Sixty Educational Books of 1939, a list compiled for the American Library Association and published in the April issue of the *Journal of the National Education Association.*

Professor Butts was one of a group of faculty members from Teachers College who spent several days in March visiting schools and colleges in Virginia and North Carolina.

Professor Harold F. Clark spoke before the Consumer Education Conference held at Stephens College, Columbia, Mo., April 1 to 3 on the subject "Vitalizing Economic Education." On April 10, Professor Clark discussed the topic "Education for All the People" with the school principals of central Pennsylvania at their Round Table Conference.

Psychological and Biological Foundations

Professor George W. Hartmann served as chairman of the session on "Social Attitudes" at the eleventh annual meeting of the Eastern Psychological As-

sociation in Atlantic City, N. J., on April 6.

"Force and Violence in Human Affairs" was the topic discussed by Professor Hartmann at a recent meeting of the Rockland County Peace Association in Tompkins Cove, N. Y.

DIVISION II
ORGANIZATION AND ADMINISTRATION OF EDUCATION

Teachers Colleges and Normal Schools

Professor E. S. Evenden, as one of the vice-presidents of the Eastern States Association of Professional Schools for Teachers, participated in the meetings of that association held April 4 to 6. He presented a paper before the session of the Administrative and Instructional Division in which he described the program in teacher education which is being conducted by Barnard College, Columbia College, and Teachers College in cooperation with the Commission on Teacher Education of the American Council on Education. Discussion of the paper was led by President Harry A. Sprague of the State Teachers College at Montclair, N. J., and President Lester K. Ade of State Teachers College at Mansfield, Pa.

On April 5 the Teachers College staff members working in the field of normal school and teachers college education, with other members of the Teachers College faculty, gave a tea in the Grace Dodge Room for the faculty- and student-delegates from normal schools and teachers colleges participating in the meeting of the Eastern States Association of Professional Schools for Teachers.

Professor Evenden attended a meeting in Chicago, on April 8 and 9, called by the Commission on Teacher Education of the American Council on Education to discuss the problems connected with the preparation of college teachers. The conference was made up primarily of representatives of liberal arts colleges and teachers colleges—the institutions most immediately concerned with the subject of the conference.

Public School Systems

On April 8 Professor N. L. Engelhardt addressed the Conference on Educational Measurements held at Indiana University on the topics "School Plant Standardization" and "The Measurement of School Business Administration." On the evening of April 9 he addressed the Hartsdale, N. Y., Parent-Teacher Association meeting. His subject was "Educational Changes Needed to Assure Equal Educational Opportunity." On April 17 he acted as discussion leader for the seminar on "The School Plant" during the Northern Regional Conference of the New Jersey State Elementary Principals' Association in Ridegwood, N. J. Professor Engelhardt also spoke before the Kentucky Education Association convention in Louisville on April 18, taking as his topics "The Place of the Boards of Education in the Public School System" and "Secondary Education in the Community School."

Education Within Prison Walls, by Walter M. Wallack and Glenn M. Kendall (who received their Doctor of Education degrees from Teachers Col-

lege) and Howard L. Briggs has been included among the Sixty Educational Books of 1939. This is the first volume on correctional education to be included in this list. It is published by the Bureau of Publications of Teachers College.

The Administration Club met on April 19 at the home of Professor and Mrs. George D. Strayer in Riverdale, N. Y. Professor Will French spoke to the group on "Who Should Graduate from High School?" Discussion and a social hour followed. The annual spring picnic of the Administration Club was held on May 18 at the Horace Mann School for Boys and at the home of Professor and Mrs. Strayer. All present and former members of the club, and their families, were invited. Games and sports began at two o'clock on the playing field of the School, and a picnic supper was served on the Strayer lawn.

On April 6 Professor Paul R. Mort spoke at Elkton, Md., before the Eastern Shore Regional Group of the State Teachers Association on the subject "Equalizing the Educational Offerings of Our Schools." On April 22 Professor Mort participated in a seminar held at Harvard University on "The Administrative Process in the School of Public Administration."

Secondary Education

On April 4 Professor Thomas H. Briggs addressed the North Central Association of Colleges and Secondary Schools at its annual meeting in Chicago on the significance in other states of the reports of the Regents' Inquiry into the Character and Cost of Public Education in the State of New York. Professor Briggs proposed that the Association, perhaps cooperating with other professional organizations, set up a continuing body of experts to prepare curriculum materials.

The Emotionalized Attitudes, a monograph prepared by the members of Education 335-336M under the direction of Professor Briggs, has been published by the Bureau of Publications of Teachers College. It discusses the contributions of research to a better understanding of the effect of emotionalized attitudes on learning and character.

On April 17 Professor Elbert K. Fretwell spoke to a group meeting of the sixth annual Child Welfare Institute held at the Walt Whitman Hotel in Camden, N. J. Professor Fretwell attended the meeting of New Jersey Junior High School Principals at Pierrepont Junior High School in Rutherford on April 24 and served as a member of a panel which discussed the problem of articulation.

Recent activities of Professor Will French have included participating in the high school principals' conference at the University of Wisconsin, Madison, March 30; attending a meeting of the Implementation Committee of the National Association of Secondary School Principals, Chicago, March 31 to April 2; speaking at a Parent-Teacher Association meeting, Plainfield, N. J., April 9; participating in the Maryland high school principals' conferences, April 22 to 24, the Massachusetts high school principals' conference, April 25, and the school administrators' conference, Yonkers, N. Y., April 26.

The Secondary Group, an organization composed of heads of secondary schools in and around New York City, held its final meeting of the academic year at the Men's Faculty Club on April 15. Professor French addressed the group on the work of the Implementation Committee of the National Association of Secondary School Principals.

At the Eastern Pennsylvania Industrial Arts Conference on April 27, Professor Fretwell served as discussion leader on the subject "Extracurricular Activities to Which Industrial Arts Procedures Lend Themselves," and addressed a luncheon group on "Industrial Arts Values in School and out." The conference was under the direction of Mr. E. E. Howard, director of industrial arts education at the State Teachers College in Millersville, Pa., where the meeting was held.

Vocational Education

On March 29 Professor Edwin A. Lee spoke before the Illinois Industrial Education Association at Chicago on "The Place of Vocational Training in a Modern Education Program." Professor Lee was one of the speakers at the seventh annual California Conference on Business Education, held in Los Angeles on March 18 and 19. His topic was "Profits and Losses."

DIVISION III
GUIDANCE

Student Personnel Administration

Professor Ruth Strang is serving as chairman of the program committee of the New York State Association of Deans and Other Guidance Personnel. Plans are being made for the annual meeting, which will be held in New York City on November 7 to 9. Other members of the program committee are as follows: Dr. Adele Bildersee, dean of women, Brooklyn College; Miss Dorothy Bourne, dean of girls, High School, Rye, N. Y.; Miss Kathrene Ensign, assistant principal, Memorial High School, Pelham, N. Y.; Professor Esther Lloyd-Jones of Teachers College; Dean Herbert Hawkes of Columbia College; Dr. Anne L. Hawkes of the Carnegie Foundation; Mrs. Juliana S. Haskell, adviser to women graduate students, Columbia University; Dean C. M. McConn, New York University; Miss Grace MacArthur, dean of women, State Normal School, New Paltz, N. Y.; Dr. Isabel Wallace, freshman adviser and vocational counselor, University of Rochester; Mrs. R. F. Wright, adviser of women, College of the City of New York; and Miss Frances Wilson, a member of Superintendent Harold G. Campbell's Committee on the Evaluation of Guidance in New York City.

On April 20 Professor Strang attended the state meeting of the New Jersey School Library Association at Atlantic City and spoke on "Contributions of the Librarian to the Improvement of Reading." On April 29 she attended a meeting of high school principals of Northern Westchester and the Hudson Valley, held at Mount Kisco, N. Y., and spoke on "Remedial Reading in the High School."

The Student Personnel Administration Club met in Whittier Hall on

April 11. Miss Margery Wilson, author of several books on charm and personality and director of the Margery Wilson Institute in New York City, was the guest speaker. Mr. John Kwon, boys' adviser and vice-principal in the Central Intermediate School, Honolulu, Hawaii, sang a group of Hawaiian songs, accompanying himself on the ukulele. The Club held its annual spring banquet at Butler Hall on May 9.

Guidance and Personnel

On April 20 Professor Harry D. Kitson addressed the Connecticut Branch of the National Vocational Guidance Association at New Britain on the subject "Vocational Guidance a Community Responsibility."

Professor Roy N. Anderson was chairman of a panel discussion on "The Occupational Adjustment Problems of Negroes" held by the Negro Education Club in the Grace Dodge Room on March 19.

The students in Guidance and Personnel held their thirteenth annual Vocational Guidance Follies on April 19. Dinner at the Men's Faculty Club was followed by a skit in which Charlie McCarthy learned to be a vocational counselor. The committee in charge included: Miss Pamela Garvin, chairman; Mr. DWane Collins, banquet; Messrs. David Fils and Norman Kaplan, publicity and program; Mrs. Genevieve Hunter, costumes; Mr. Selig Silberger, properties; Miss Carolyn Lichtblau, decorations. A large number of students and alumni attended.

Guidance Laboratory

On April 3 and 4 fifteen members of the faculty of the New Jersey State Teachers College at Newark met with approximately the same number from Teachers College to discuss the guidance program that is being worked out in connection with the special pre-service training plan with which Teachers College is experimenting. Dr. C. E. Prall, Dr. Lawrence Jarvie, and Dr. Maurice Troyer of the Commission on Teacher Education of the American Council on Education met with the group. The visitors attended several undergraduate and graduate seminars to gain some idea of the way in which the curriculum for this pre-service group is organized at Teachers College. At a meeting of the entire group Dr. Prall discussed briefly some major problems that the various centers which are cooperating with the American Council are encountering; Dr. G. H. Menke, who has taken most of the responsibility for admission of students to the pre-service group, discussed the policy of admissions that has been followed during this first year; Professor Magdalene Kramer discussed some of the problems that have arisen in connection with the speech tests and remedial program for this group; Mr. John D. Leith, who is in charge of placement for Teachers College, discussed the placement procedures that have been followed with this special group; and Dr. Gertrude Driscoll and the group of major students in Guidance who have been working closely with her in the guidance program of the pre-service group described what they have done in the counseling program, testing, and recording of information. During this session Professor

Esther Lloyd-Jones presided. At a later meeting Dr. Jarvie presided while the entire group discussed the following outstanding problems which the guidance group faces at the present time: how to provide a more adequate health program for the group; how to provide a more adequate social program; how to coordinate more satisfactorily the various elements of an extremely complex situation; how to serve better the needs of those instructors who are interested in the guidance of their students; and how to encourage the interest of instructors who are more interested in subject matter than in students.

DIVISION IV
INSTRUCTION

Curriculum and Teaching

On April 1 the report of the Curriculum Study Program in the Metuchen, N. J., public schools was delivered to the Board of Education. This study was carried on cooperatively by the staff and students in Education 300Cx, Advanced Curriculum and Teaching Problems Relating to the Field, and the Metuchen Board of Education, administrative staff, and teachers. From December 1, 1938 to February 1, 1940, the period covered by the report, approximately one hundred visits to the schools were made by thirty-seven members of the faculty of Teachers College and forty-six graduate students. Numerous conferences were held with individual teachers and departmental and divisional groups of teachers as well as with the entire instructional staff, the principals, and the Board of Education. The purpose of the Curriculum Study as expressed in the final progress report has been: "to assist the Board of Education, the teaching staff, the pupils, and the community of Metuchen (1) in making as sound an appraisal as possible of the present educational offerings in the Metuchen Public Schools, and (2) in working cooperatively through meetings, conferences, discussions, readings, demonstrations, and observations to improve present curriculum and teaching practices to the end that all concerned might set up an increasingly sounder method for securing for the children and youth of the community the highest and best that education can provide."

The faculty and student group in Education 300Cx is beginning a similar project in Rutherford, N. J., with the cooperation of Supervising Principal Guy Hilleboe and his staff.

Professor Jean Betzner attended a meeting of the New York Society for the Experimental Study of Education held at College of the City of New York and took part in an Activity Program panel which discussed "The Curriculum in Progressive Public Schools." Professor Betzner also attended the forty-seventh annual convention of the Association for Childhood Education held in Milwaukee, Wis., April 29 to May 3 and led a study group in a discussion of "Practising Democracy as Teachers and Administrators." En route to the convention Professor Betzner spoke before the elementary teachers of Youngstown, Ohio. Her topic was "Satisfactions in Teaching."

On April 20 Professor H. L. Caswell took part in the Educational Confer-

ence on the Child and the Curriculum held in Paterson, N. J., under the sponsorship of the New Jersey State Teachers College and the Alumni Association.

On March 29 Professor W. B. Featherstone participated in judging textbooks to be included in the selection by the American Institute of Graphic Arts of the sixty best textbooks published during 1939.

Professor Featherstone gave two addresses at the general sessions of the Regional Conference of the Progressive Education Association held in Richmond, Va., on April 12 and 13, and spoke at the luncheon session of the Sixteenth Conference on the Education of Teachers in Science held at the Men's Faculty Club on April 26.

On April 3 Miss Roma Gans spoke before a joint meeting of the Association for Childhood Education and the Intermediate Grade Teachers Association in Plainfield, N. J. Her topic was "The Outlook for the Teacher." On April 8, Miss Gans addressed the Parent-Teacher Association of the Chancellor School, Newark, N. J., on "An Adequate Education for Our Children"; on April 22, she spoke to the parents and teachers of the Cleveland School in Englewood, N. J., on "The Responsibility of Parents and Teachers for the Education of Young Children"; and on April 29 she addressed the Grand Rapids Teachers Club and a dinner meeting of the High School Women's Club of Grand Rapids, Mich. Miss Gans also attended the meetings of the Association for Childhood Education in Milwaukee, Wis., from April 30 to May 3.

Professor L. Thomas Hopkins was chairman of a panel discussion on "The Teacher and Her Job" at New Castle, Del., on April 5 in connection with the New Castle County Teachers Association meetings.

On April 19 Professor Hopkins addressed the Student Welfare Council in Philadelphia, taking as his topic "The Emerging Curriculum." He was the principal speaker on the afternoon program of the Sixteenth Conference on the Education of Teachers in Science held at Teachers College on April 26.

Professor Lois Coffey Mossman visited the schools of Essex Fells, N. J., on April 15 and met with the Board of Education and school administrators to offer suggestions and discuss with them ways of bettering the school setup. On April 19, Professor Mossman spoke on "Principles of Teaching" before the Tenth New England Health Institute held in Hartford, Conn., and on April 29 in New York City she addressed a meeting of the Illustrated Story Paper Conference, which is a subsection of the Editorial Section of the International Council of Religious Education.

Professor Ernest G. Osborne was chairman of a panel discussion at the second annual meeting of the New York State Association for Nursery Education, which was held on April 19 and 20 in Albany, N. Y. The discussion centered around a talk given by Dr. Caroline B. Zachry on "Expressions of Power by Young Children." On April 23, Professor Osborne spoke on "The Role of the Father" before a Fathers' Meeting at the Dalton School of New York City. At the meetings of the Association for Childhood Education held in

Milwaukee, Wis., April 29 to May 3 he served as leader of a study class on the topic "Pupil-Parent-Teacher Relationships as They Affect Behavior."

On April 1, under the sponsorship of the Elementary Club, Dr. Lawrence K. Frank of the Macy Foundation spoke on "Mental Hygiene in Relation to Education." Members of the faculty and students were invited to hear him. Other recent speakers at the Thursday morning Coffee Hour of the Elementary Club have been: Miss Elsa Findlay of the Physical Education department, whose talk on "Rhythms in Daily Life" was supplemented by a demonstration given by several of her students; Professor George A. Kopp of the Speech department, who spoke on "Speech Difficulties in the Elementary School"; and Professor Fannie W. Dunn, who told about her garden. Members of the Elementary Club spent an evening with Professor Elise E. Ruffini learning to make jewelry from macaroni, and table ornaments from papier-mâché.

Professor Winifred E. Bain appeared on the program of the convention of the Florida Education Association held in Orlando March 26 to 28. She spoke before the Department of Teacher Education on "Vitalizing the Experiences of Students in Teacher Education," and before the Kindergarten-Primary Department on "Democracy in Education." She was also guest speaker at the annual luncheon meeting of the Florida Branch of the Association for Childhood Education.

Social Science

Professor Arthur E. Bestor, Jr., contributed an article entitled "Fourierism in Northampton" to the *New England Quarterly* for March.

Professor Bestor was one of four faculty members associated with the Special Pre-service Program of Teacher Education being conducted under the auspices of the American Council on Education who visited secondary schools, teachers colleges, and universities in Virginia and North Carolina during the last week in March and the first week in April.

Professor J. Montgomery Gambrill and Professor Bestor attended the meeting of the Middle States Association of History and Social Science Teachers held at Baltimore on April 19 and 20. Professor Bestor is editor of the *Proceedings* of the Association.

Professor Alice W. Spieseke, Miss Josephine Mayer, and Professor Bestor attended the sessions of the American Academy of Political and Social Science held at Philadelphia on April 12 and 13.

Professor Erling M. Hunt addressed the Parent-Teacher Association at Rutherford, N. J., on April 23, taking as his topic "Education for Democracy." He addressed the New England History Teachers Association at Durham, N. H., May 4 on "Meeting Propaganda in the Classroom."

Natural Sciences

Professor Herbert J. Arnold gave an illustrated lecture on "The Glaciers of Norway" to the Physiographers and Geographers Club of New York at Teachers College on April 9.

The Storehouse of Civilization, by C. C.

Furnas, and *The Control of Organisms*, by Frederick L. Fitzpatrick, two of the volumes recently issued as part of the work of the Bureau of Educational Research in Science and published by the Bureau of Publications of Teachers College, have been awarded a place in the Second Annual Textbook Exhibition of the American Institute of Graphic Arts. The purpose of this exhibition is to show the sixty textbooks of the highest artistic and technical excellence, selected on the basis of physical attractiveness, suitability to purpose, and the success with which the designer has solved the various problems imposed. The books will be on display in the New York Public Library and in other libraries throughout the country.

English

Dr. Imogene N. Cowles will represent the General Federation of Women's Clubs on the program of the annual conference of the American Association of Adult Education in New York on May 20. At the "Barnard in Bergen" meeting in Bergen, N. J., on April 15, Dr. Cowles spoke on "The Congress on Education for Democracy."

Mr. Walter Ginsberg made two addresses at the third annual Audio-Visual Conference sponsored by Pennsylvania College for Women, Duquesne University, and Carnegie Institute of Technology at Pittsburgh, Pa., on April 19 and 20. At the general meeting he spoke on "Scientific Aids to English," and at the English section the subject of his address was "Effectiveness of Recordings in Teaching Shakespeare." Mr. Ginsberg discussed "Technology and English Teaching" at a meeting of the English teachers of Erie, Pa., and vicinity on April 22, and "How Radio Serves English" at a meeting of the English teachers of Nassau County which was held at Valley Stream, N. Y., on May 3.

The Revival of the Humanities in American Education, by Patricia Beesley Irwin, has recently been published by the Columbia University Press as the first of a series of studies in the Humanities sponsored by Professor Lennox Grey.

Speech

Professor Magdalene Kramer attended the conference of the Eastern Public Speaking Association held at the Hotel Mayflower, Washington, D. C., March 28 to 30. She was chairman of the section on Speech and Teacher Education and was elected vice-president of the Association for the year 1940-41.

On April 4 Professor Kramer discussed "Speech in the Elementary School" with the teachers of East Rutherford, N. J.

Mr. Charles Wells addressed the conference of the Eastern Public Speaking Association on "Dramatics in Adult Education" in the section devoted to a discussion of "Speech in Adult Education."

Music

Professor Miles A. Dresskell was the soloist at the graduation exercises conducted at the Poppenhusen Institute, Flushing, L. I., on April 10, presenting music for violin and viola d'amore. Mrs. Dresskell accompanied him.

On April 3 Professor Howard A. Murphy addressed a meeting of the Columbia Dames on "Wagner's Twilight of the Gods, in 1940."

At the biennial meeting of the Music Educators National Conference held in Los Angeles, March 30 to April 5, Professor Lilla Belle Pitts addressed the Junior High School Section, taught a demonstration class of ninth grade pupils at the meeting of the division on Correlation and Integration, and served on the panel of the Humanities discussion on the Junior College program. Professor Pitts was elected to membership on the executive board of the Conference.

On April 15 Professor Pitts spoke to the Elementary School Teachers Association of Long Beach, N. Y., taking as her topic "Music Appreciation in the Elementary Grades."

In addition to conducting four lecture-demonstration meetings as chairman of the committee on piano classes for the Music Educators National Conference at Los Angeles, Professor Raymond Burrows gave addresses at two other meetings during the conference week.

On April 9 Professor Burrows addressed a class at Centenary College School of Music, Shreveport, La. He followed the address with a studio critic lesson. In the afternoon he gave a lecture illustrated at the piano on the topic "Piano Teaching the Modern Way."

In addition to Professors Pitts and Burrows, the following forty-two former students or staff members took part in the program of the Music Educators National Conference, giving addresses or demonstrations or conducting musical offerings: LeRoy Allen, University of California, Los Angeles; Warren D. Allen, Stanford University, Palo Alto, Calif.; John W. Beattie, dean, School of Music, Northwestern University, Evanston, Ill.; Laura Bryant, director of music, public schools, Ithaca, N. Y.; Gillian Buchanan, Eastern New Mexico College, Portales, N. M.; Samuel T. Burns, University of Indiana, Bloomington, Ind.; Frances Smith Catron, Ponca City, Okla.; Helen Christianson, University of California, Los Angeles; N. W. Christiansen, Utah State Agricultural College, Logan, Utah; Van Christy, Santa Barbara State College, Santa Barbara, Calif.; Sarah Y. Cline, Cincinnati, Ohio; Sara M. Conlon, assistant supervisor of music, St. Louis, Mo.; Maurice Faulkner, San Jose State College, San Jose, Calif.; Marion Flagg, Horace Mann School, Teachers College, Columbia University; Roy E. Freeburg, San Francisco State College, San Francisco, Calif.; Glenn Gildersleeve, State Director of Music, Dover, Del.; Mabelle Glenn, director of music, public schools, Kansas City, Mo.; Fritz Heim, Horace Mann School, Teachers College, Columbia University; Edith Hitchcock, Long Beach Junior College, Long Beach, Calif.; George Howerton, Evanston, Ill.; Edith M. Keller, Columbus, Ohio; Hazel Gertrude Kinscella, University of Nebraska, Lincoln, Neb.; William S. Larson, Eastman School of Music, Rochester, N. Y.; George L. Lindsay, director of music, public schools, Philadelphia, Pa.; Joseph Maddy, University of Michigan, Ann Arbor, Mich.; Amy Grau Miller, Pasadena Junior College, Pasadena, Calif.; Russell V. Morgan, director of music, public schools, Cleveland, Ohio; Theo-

dore Normann, University of Missouri, Columbia, Mo.; Herbert Norris, Washington State College, Pullman; Alton O'Steen, Ohio State University, Columbus; Adolph Otterstein, San Jose State College, San Jose, Calif.; Ralph J. Peterson, Los Angeles City College, Los Angeles, Calif.; Carol M. Pitts, State Teachers College, Trenton, N. J.; Lenel Shuck, director of music, Fresno, Calif.; George Spangler, Philadelphia, Pa.; Catherine Strouse, Emporia, Kan.; Harry F. Taylor, Eastern New Mexico Junior College, Portales, N. M.; Maurene Thompson, San Jose State College, San Jose, Calif.; Lorrain E. Watters, director of music, public schools, Des Moines, Iowa; Lorin Wheelwright, director of school music, Salt Lake City, Utah; George Wilson, University of Arizona, Tucson; and Glenn H. Woods, director of school music, Oakland, Calif.

Fine and Industrial Arts

On April 6, Professor Ray Faulkner attended the conference of the Eastern States Association of Professional Schools for Teachers at the Hotel Pennsylvania, New York City, and spoke on "Basic Assumptions in the Arts." He addressed the Graduate Club of Teachers College recently on "Self-Realization through the Arts."

Professor Faulkner has been elected to membership on the Eastern Arts Association Council for 1940-41 and Mr. Edwin Ziegfeld has been appointed a member of the committee of Division E—Teacher Preparation.

Both Professor Faulkner and Mr. Ziegfeld attended the Western Arts Association Convention held in Cincinnati, Ohio, April 17 to 20. Professor Faulkner spoke at two of the meetings, taking as his topics "New Values in Art Education" and "Art Education and Democracy—A Challenge." Mr. Ziegfeld is a member of the Western Arts Association Council.

Household Arts and Sciences

Professor Grace MacLeod and Dr. Clara M. Taylor attended the meetings of the American Institute of Nutrition and the Federation of American Societies for Experimental Biology in New Orleans March 13 to 16. Professor H. C. Sherman is president of the Institute. While in New Orleans, Professor MacLeod participated in the annual meeting of the editorial board of *The Journal of Nutrition.*

At the April meeting of the teachers of homemaking in the schools of Greater New York, Professor Mary S. Rose spoke on "World Movements in Nutrition."

Professor Benjamin R. Andrews recently addressed the staff of the Great Neck, L. I., High School on "Home Economics in Education." He also addressed the Pennsylvania State Home Economics Association at the Hotel Adelphia, Philadelphia, on May 4.

On April 5 Professor Andrews spoke over Station WNYC on "The New York State Savings Bank Life Insurance."

Dr. Leora James Sheridan of Swarthmore, Pa., a former student in the department, will conduct a summer study tour to Brazil. Dr. Sheridan taught in the University of Brazil last summer in

connection with a program in education presented by Professor Arthur Jones of the University of Pennsylvania and is therefore in a position to provide many contacts and unusual experiences for members of the study tour.

Commercial Education

Professor Hamden L. Forkner was appointed coordinating chairman of the business education section of a study on junior colleges which is being conducted by the Commission on Junior College Terminal Education. Dr. Walter Crosby Eells is director of the Commission.

Professor Forkner is coauthor with Professor Paul Carlson, director of commercial education, State Teachers College, Whitewater, Wis., and Professor Alva Prickett, head of accounting department, School of Business, Indiana University, Bloomington, Ind., of a textbook entitled *Twentieth Century Bookkeeping and Accounting* which has just been published by the Southwestern Publishing Company.

An article by Mrs. Esta Ross Stuart entitled "Basic Principles upon Which Correct Typewriting Teaching Techniques Are Built" appeared in the Spring issue of *The National Business Education Quarterly*. Another article by Mrs. Stuart entitled "Providing for Varying Abilities of Shortland Learners" appeared in the April issue of *The Business Education World*.

An article by Miss Thelma M. Potter on "Teaching Problems in Office Practice" will be published in the May issue of *The Business Education World*.

Physical Education

Professor C. L. Brownell addressed the State Teachers Association meeting of the South Carolina Health, Physical Education, and Recreation Association on March 14 at Greenville, S. C. His topic was "The Teacher and Health Education."

DIVISION V

NURSING EDUCATION

Professor Elizabeth C. Burgess spoke at the meeting of the Connecticut State Nurses' Association in Bridgeport, Conn., March 28 on "Accreditation, a Helpful Program for the School of Nursing, the Hospital, and the Community." Professor Burgess is chairman of the Committee on Accrediting of the National League of Nursing Education.

Professor Mary E. Chayer attended the Tenth New England Health Institute at Hartford, Conn., on April 18 and discussed the subject "Evaluating the Effectiveness of the School Nursing Service."

Mrs. R. Louise McManus spoke on March 27 in Newark, N. J., under the auspices of the New Jersey State Board of Nurse Examiners, to the principals of schools of nursing in the state on "Tests and Measurements in the School of Nursing." Mrs. McManus also spoke on the testing program in nursing at the Spring Institute of the Ohio State League of Nursing Education in Akron, Ohio, on April 10 and at the meeting of the Maryland League of Nursing Education held in Baltimore, Md., on April 25.

A special number of *The Nursing Education Bulletin*, containing the proceedings of the Alumnae Celebration of the Fortieth Anniversary of Nursing Education in Teachers College, has just been issued. Copies may be purchased through the Bureau of Publications, Teachers College.

EDUCATIONAL DEMONSTRATION AND PUBLIC SERVICE

Lincoln School

Dr. Emmett Brown contributed an article, "The Plight of High School Physics, II, Peccant Psychology," to the February issue of *School Science and Mathematics*.

Mrs. Marjorie Bingham attended the conference on Dance in Education at the Lennox School, March 16. She has just completed a report form, to be tried out nationally in physical education, for the Records Committee of the Progressive Education Association.

Miss Elaine Dickinson contributed an article, "Growth in Expressive and Appreciative Abilities through Interest in the Handicrafts," to the March issue of the *Childhood Education Bulletin*.

Professor Lester Dix took part in panel discussions on "New Horizons," held at Stevens-Hoboken Academy, Hoboken, N. J., April 12, and "Education for Democracy," held under the auspices of the Parent-Teacher Association of Public School No. 6, The Bronx, April 13.

Miss Anne T. Eaton is author of *Reading with Children*, published in April by the Viking Press. Miss Eaton contributed an article of the same title to the March-April issue of *The Horn Book*.

Mr. Henry C. Fenn and Mr. Lawrence Riggs are authors of an article entitled "Exploring Explorers," which appeared in the January *Educational Forum*. This article describes a project developed with an eighth grade at Lincoln School.

Miss Marion Quin gave a talk on "A Creative Art Studio" at the meeting of the Eastern Arts Association held March 27 in Philadelphia.

Mrs. Arensa Sondergaard is participating in a Syracuse University extension course on Methods and Materials in the Elementary School.

Mrs. Ouida Meyer prepared two Lincoln School groups, students and parents, to take part in the fourteenth annual festival of the English Folk Dance Society held at the Seventh Regiment Armory on May 4.

LIBRARY

Miss Ethel M. Feagley and Mrs. Mary D. Grant spoke at the Eastern States Association of Professional Schools for Teachers April 6 on "The Work of the Library Consultant, or Reader's Adviser, in a Teachers College Library."

The March issue of *Classroom Literature*, entitled "Stepping Stones," is a list of reading sequences designed to aid the teacher in choosing books for boys of low reading ability and meager literary background. The books are listed under subjects which appeal to

boys, and the progression of titles is suggestive of "stepping stones" to good literature.

The March issue of *The Library Consultant Book List* is an annotated list of entertaining and distinguished autobiographies and biographies of well-known teachers, deans, and college presidents. Single issues of this publication are available at five cents each; the subscription price is fifty cents for ten issues.

OFFICE OF PLACEMENT SERVICE*

The following list continues the appointments reported by the Office of Placement Service in the March RECORD:

Dunning, Sarah (A.M. 1939), teacher of art, Riverside School, New York City.

Earl, Albert Ernest (A.M. 1939), teacher of science, Junior High School, Mamaroneck, N. Y.

Edwards, Albert Asbury (A.M. 1934), educational adviser, Camp S-113 CCC, Camden, N. Y.

Ellis, Mary (A.M. 1939), dietitian, Nathan Littauer Hospital, Gloversville, N. Y.

Elsom, Hazel A. (A.M. 1938), music critic teacher, East Carolina Teachers College, Greenville, N. C.

Ensor, Dorothy E. (A.M. 1939), interviewer, National Youth Administration, Canton, Ohio.

Fallaw, Wesner, administrative assistant and instructor in education, Asheville Teachers College, Asheville, N. C.

Faries, Miriam (A.M. 1929), adviser to girls, Evening Session, College of the City of New York, New York City.

Feldhusen, Marie (A.M. 1931), instructor in home economics, Maryland College for Women, Lutherville, Md.

Ferrell, Grace E. (A.M. 1938), professor of music education, Paul Quinn College, Waco, Tex.

Fink, William Bertrand, teacher of social studies and English, High School, Sparrows Point, Md.

Finley, Esther M. (A.M. 1939), supervisory nurse, Wood County Chapter, American Red Cross, Parkersburg, W. Va.

Fischer, Edwin Rees, instructor in economics, College of Commerce, Louisiana State University, University, La.

Fox, Lorene K. (A.M. 1935), associate head of department of education, State Normal School, Fredonia, N. Y.

Franck, Doris J., teacher of elementary and high school subjects, Lakewood Hall, Lakewood, N. J.

Frank, Joseph, assistant teacher of French, University of California, Berkeley, Calif.

Friis, Margaret L., teacher of piano, Public Schools, Kenmare, N. D.

Frink, Frances C., supervisor of school lunchroom, Public Schools, White Plains, N. Y.

Garrison, Aletheia, teacher of English, High School, Garden City, L. I.

Gerow, Emily E., teacher of English and dramatics, Menaul School, Albuquerque, N. M.

Geyer, George H., director, Glendale Junior College, Glendale, Calif.

Gibney, Mary Agnes (B.S. 1938), director of nursing, Beth David Hospital, New York City.

Giles, Eda M., hall manager, Dickinson College, Carlisle, Pa.

Given, Leila I. (M.S. 1929), director of the Bureau of Nursing Education and supervisor of Nursing Education, State Board of Health, Wisconsin.

Godshall, Wilson Leon, assistant professor of social studies, Lehigh University, Bethlehem, Pa.

Goldberg, Mildred K. (A.M. 1938), teacher of English, High School, West Branch, Mich.

Gooch, Hettie (B.S. 1937), social health adviser, School of Nursing, St. Luke's Hospital, Chicago, Ill.

Gould, Edna Stafford (B.S. 1939), county nurse, Williamson County Health Department, Franklin, Tenn.

* Any student who is taking or has taken twelve points of work at Teachers College or any graduate of Teachers College may register with the Office of Placement Service. For initial registrations covering three years no fee is charged. For information write to the Placement Office for its booklet, *Employment of Teachers and Administrators.*

Graff, Dorothy (A.M. 1933), principal, The Louisville Collegiate School, Louisville, Ky.

Graham, Allis E. (A.M. 1938), senior interviewer, National Youth Administration, Youngstown, Ohio.

Grier, Robert C. (B.S. 1939), dean, Georgia Baptist College, Macon, Ga.

Groesbeck, Edward G. (A.M. 1938), assistant to the president, National Bible Institute, New York City.

Habecker, Anna Myrlleen (A.M. 1939), teacher of home economics, Fitch School, Youngstown, Ohio.

Haller, Ward M. (A.M. 1939), editor, Crowell Publishing Company, New York City.

Hamilton, Lois Neal, teacher of history, Glynn Academy, Brunswick, Ga.

Hale, Marjorie L. (A.M. 1938), director of health education, Y.W.C.A., New Orleans, La.

Hardt, Henry B., assistant professor of chemistry, Westminster College, Fulton, Mo.

Harrington, Ruth (A.M. 1938), assistant professor, School of Nursing, University of Minnesota, Minneapolis, Minn.

Hartman, Helen Minerva (A.M. 1934), district supervisor of vocational home economics, Purdue University, West Lafayette, Ind.

Harvey, Grace F. (A.M. 1930), teacher of art, Elizabeth Milbank Anderson Home, Chappaqua, N. Y.

Heflin, Nora Belle (A.M. 1938), supervisor of directed teaching, Santa Barbara State College, Santa Barbara, Calif.

Heinle, Edwin Christian, teacher of English and social studies, High School, Wharton, N. J.

Henrickson, Merle E., teacher of English and social studies, Pikeville College Academy, Pikeville, Ky.

Heuss, Charlotte A., teacher of English and vocational subjects, New York State Training School for Girls, Hudson, N. Y.

Hickis, Frances (A.M. 1939), elementary teacher, Highland Manor, Tarrytown, N. Y.

High, Leon C. (A.M. 1926), principal, Pacific Military Academy, Culver City, Calif.

Hoffman, Elizabeth Jean (B.S. 1939), teacher of home economics, Public Schools, Sayville, L. I.

Hoffman, Helen C., head of English department, Hannah More Academy, Reisterstown, Md.

Holdeman, W. Dean (A.M. 1939), resident head of men's hall and instructor in physical education, Doane College, Crete, Neb.

Holley, J. Andrew (A.M. 1928), deputy administrator, National Youth Administration for Oklahoma, Oklahoma City, Okla.

Holway, Amy R. (A.M. 1938), elementary teacher, Sunset Gap School, Newport, Tenn.

Hopwood, Mary Fitzgerald (A.M. 1933), kindergarten teacher, Kinkaid School, Houston, Tex.

Howard, William Woodbury, mathematics master, Mercersburg Academy, Mercersburg, Pa.

Howey, Harriet May, resident director, National Youth Administration, West Chester, Pa.

Hoyler, Mabel Jones, grade supervisor, Goshen Central School, Goshen, N. Y.

Hutchinson, Helen, teacher of Spanish, Brownmoor School, Santa Fe, N. M.

Hurley, Richard James (A.M. 1936), assistant professor of library science, Catholic University of America, Washington.

Irwin, Elizabeth Gertrude (A.M. 1934), sixth grade teacher, Public Schools, East Lansing, Mich.

James, Elva V. (A.M. 1938), assistant professor of English, Alcorn A. & M. College, Alcorn, Miss.

Jewett, Mary Louise (A.M. 1931), teacher of English, High School, North Plainfield, N. J.

Keeler, Barbara Townsend (B.S. 1939), dietitian, Four Winds, Katonah, N. Y.

Kelly, Daniel (A.M. 1939), mathematics and science master, Storm King School, Cornwall-on-Hudson, N. Y.

Kennedy, Lorene E., teacher of English and history, Junior High School, Conneant, Ohio.

Kennedy, Mary Kathryn (B.S. 1939), district supervisory nurse, Division of Public Health Nursing, State Department of Health, Albany, N. Y.

Kerkhof, Jane M., critic teacher, Walker Cooperative School, Illinois State Normal University, Normal, Ill.

Kerr, Chester A., social agency surveyor, Community Chest, San Francisco, Calif.

Kilbourne, Katherine E. (A.M. 1939), substitute instructor in home economics, Wayne University, Detroit, Mich.

Klein, Grace A. (A. M. 1939), supervisor of fourth grade student teachers, State Teachers College, Duluth, Minn.

Kuhlman, Marguerite E. (A.M. 1939), teacher of physical education, Public Schools, Spring Valley, N. Y.

Langer, Henry C., Jr., instructor in business administration, Hartwick College, Oneonta, N. Y.

Longale, James L. (A.M. 1935), principal, Nathan Hale School, Northvale, N. J.

Lovelady, Clara Mae (B.S. 1938), instructor in commercial subjects, North Carolina College for Negroes, Durham, N. C.

McCallum, William J., assistant director, Division of Employment, National Youth Administration, Austin, Tex.

McCreight, V. O. (A.M. 1939), senior master and head of English Department, Interdale School for Boys, Palo Alto, Calif.

McGowan, Mary B. (A.M. 1931), dean of women and head of home economics department, Whitworth College, Brookhaven, Miss.

McNeill, Alma (A.M. 1939), teacher of elementary subjects, Austin School, Wichita Falls, Tex.

McVeigh, John Newburn (B.S. 1937), placement counselor, Y.M.C.A., New York City.

Markham, Margaret A., second grade teacher, Ludlum School, Hempstead, N. Y.

Martin, Beverly A. (A.M. 1935), assistant state supervisor of nursery schools, Missouri State Department of Education, Jefferson City, Mo.

Marvin, William F. (B.S. 1935), teacher of ten-year-old group, Little Red School House, New York City.

Masters, Ellen C., head of English department, Bentley School, New York City.

Mather, Stella (A.M. 1924), acting head of Home Economics Department, Spelman College, Atlanta, Ga.

Maxwell, Grace (A.M. 1934), professor of foods and nutrition, Marycrest College, Davenport, Iowa.

Mickle, Alice, instructor in art, Monticello College, Godfrey, Ill.

Montaperto, Maurice (A.M. 1932), teacher of music, New York State Vocational Institution, West Coxsackie, N. Y.

Nagle, Harry (A.M. 1938), personnel supervisor, Muskingum Work Experience Center, National Youth Administration, New Philadelphia, Ohio.

Nalbach, Ernest W. (A.M. 1935), teacher of music, Junior High School, Port Chester, N. Y.

Nankivel, Mary, teacher of elementary subjects, Tuxedo Park School, Tuxedo Park, N. Y.

Nannini, Louis (A.M. 1939), teacher of social studies, High School, Manhasset, L. I.

Neff, Mildred E., home economist, Westchester County Department of Family and Child Welfare, White Plains, N. Y.

Nelson, Corena L. (A.M. 1939), third grade critic teacher, Training School, State Teachers College, Dickinson, N. D.

Norton, Ethel Sarah (A.M. 1939), dean of women and professor of English, Albright College, Reading, Pa.

Nothnagle, Lester A. (A.M. 1939), methods man on production, General Electric Company, Bridgeport, Conn.

O'Donnell, Florence E. (B.S. 1938), acting director of kindergarten, Ninth Street School, Milwaukee, Wis.

Osterman, Marie, instructor in science, Ohio Valley General Hospital, Wheeling, W. Va.

Outland, Lloyd (A.M. 1935), teacher of instrumental music, Public School, Sweet Water, Ala.

Parks, Nellie S. (B.S. 1921), acting assistant professor of nursing education, University of Pennsylvania, Philadelphia, Pa.

Patierno, Elvira, fifth grade teacher, Humiston School, Cheshire, Conn.

Patton, Augusta (A.M. 1927), field worker for National League of Nursing Education Committee on Accrediting, New York City.

Peterson, Karin, secretary, Committee on International Relations, American Library Association, New York City.

Philibosian, Ruth (A.M. 1939), kindergarten teacher, Belmont Boulevard School, Elmont, L. I.

Phillips, Ruth R. (A.M. 1939), assistant dietitian, Wellesley College, Wellesley, Mass.

Pierce, J. Leslie (A.M. 1938), instructor in voice, Newcomb College, New Orleans, La.

Pike, Ruth L. (A.M. 1937), home economist, The Voluntary and Cooperative Groups Magazine, New York City.

Platz, Mabel (A.M. 1930), instructor in speech, Dickinson Seminary, Williamsport, Pa.

Poey, Jeannette Richards (A.M. 1934), lecturer and demonstrator, United Fruit Company, New York City.

Polster, Francis X., Jr., teacher of mathematics, Delaware Valley Central School, Callicoon, N. Y.

Post, Emaleen Graham (M.S. 1933), administrative dietitian, Neurological Institute, New York City.

Potter, Marian (B.S. 1938), second grade teacher, Roosevelt School, Indio, Calif.

Rasmussen, Walter B., teacher of social studies, High School, Oaks, Okla.

Rawson, Edna May (A.M. 1936), teacher of vocal music, High School, Dobbs Ferry, N. Y.

Reed, La Vada (A.M. 1931), critic supervisor, Southern Oregon College of Education, Ashland, Ore.

Reichard, Suzanne Kate, assistant in clinical psychology, Columbia University.

Repman, H. Eugene (A.M. 1935), supervisor of music, Public Schools, Rochester, Pa.

Reynolds, Vincent G., head of English department, Texas Military College, Terrell, Tex.

Rogers, Carl R. (Ph.D. 1931), professor of psychology, Ohio State University, Columbus, Ohio.

Ross, Alia Josephine (A.M. 1933), instructor in music, Greensboro College, Greensboro, N. C.

Row, William H. (A.M. 1934), director of speech arts, Daniel Webster High School, Tulsa, Okla.

Sachs, Ruth M. (A.M. 1931), director of residence, Y.W.C.A., Buffalo, N. Y.

Salisbury, T. Lucile (A.M. 1939), supervisor of rural education, State Teachers College, Elizabeth City, N. C.

Santeramo, Edward (B.S. 1938), teacher of music, High School, Garfield, N. J.

Shank, Dorothy E. (B.S. 1923), associate household equipment specialist, Bureau of Home Economics, U. S. Department of Agriculture, Washington, D. C.

Sherwood, Ethel (B.S. 1928), teacher of French and English and librarian, High School, Troutville, Va.

Sickman, Harland M. (A.M. 1936), recreation consultant, Parkchester Development, Metropolitan Life Insurance Company, New York City.

Sigafoose, Esther T., primary teacher, McKeefrey School, McKeefrey, W. Va.

Slavens, Opal (A.M. 1938), deputy county school commissioner, Saginaw County, Mich.

Smail, Josephine Sebring (A.M. 1936), director of young people's work, Bethany Union Church, Chicago, Ill.

Solum, Nina E. (A.M. 1935), dean of women, Eastern State Normal School, Madison, S. D.

Staael, Nora (A.M. 1932), instructor in physical education, State Teachers College, Saint Cloud, Minn.

Steele, John Lincoln, student counselor and instructor in English, Boston University, Boston, Mass.

Stein, Florence (A.M. 1936), staff nurse and health education coordinator, Public Schools, San Diego, Calif.

Stenson, Helen Elaine, rural field supervisor, Southern Illinois Normal University, Carbondale, Ill.

Stephenson, Doris E. (B.S. 1939), assistant dietitian, Westchester Division, New York Hospital, White Plains, N. Y.

Stone, Brinton Harvey (A.M. 1937), teacher of social studies, Bronxville Junior High School, Bronxville, N. Y.

Stover, G. F., instructor in education, State Teachers College, Troy, Ala.

Stoyell, Marion, assistant director of dining halls, Yale University, New Haven, Conn.

Taggart, Allen O., teacher of commercial subjects, High School, Amarillo, Tex.

Tindle, Nora Mae, first grade teacher, Avery School, Webster Groves, Mo.

Titus, Shirley C. (B.S. 1925), director of nursing, Children's Hospital, Los Angeles, Calif.

Tucker, Amanda (A.M. 1933), nutrition consultant, State of Alabama, Montgomery, Ala.

Tuckman, Jacob (Ph.D. 1934), unit supervisor, Home Relief Division, Department of Welfare, New York City.

Wadsworth, Lettie (A.M. 1933), county nurse, Davies County, Washington, Ind.

Wagner, Harriet B. (B.S. 1938), social worker, New York League for Hard of Hearing, New York City.

Walsh, Cecelie E. (B.S. 1935), director of nursing, Midwestern Area of American Red Cross.

West, M. Hermine, instructor in nursery school education, Fordham University, New York City.

Wever, Elizabeth S. (A.M. 1938), teacher of English, High School, Sparrows Point, Md.

White, Orline Wilson (A.M. 1938), supervisor of social studies, Brookville High School, Lynchburg, Va.

White, Sarah Hazel (B.S. 1922), first grade teacher, Public School, Elmont, L. I.

Whitney, Marjorie, interviewer, National Youth Administration, Mansfield, Ohio.

Wickizer, Ida Marie (A.M. 1939), assistant in music department, Hastings College, Hastings, Neb.

Williams, E. Jane (A.M. 1939), librarian and remedial reading teacher, Gordon Junior High School, Coatesville, Pa.

Williams, S. Jocelyn, teacher of social studies, Sequoia Junior High School, Redwood City, Calif.

Wilson, Dorothy Dawn (A.M. 1937), teacher, Indiana State School for the Deaf, Indianapolis, Ind.

Wilson, Mary C., fifth grade critic, Louisiana Polytechnic Institute, Ruston.

Wood, Margaret Mary, assistant professor of sociology, Russell Sage College, Troy, N. Y.

Yarbrough, Blanche, teacher of English, High School, Clovis, N. M.

Young, Marian A. (A.M. 1938), test editor, World Book Company, Yonkers, N. Y.

Zimmerman, Ruth Larson, instructor in English, State Teachers College, Livingston, Ala.

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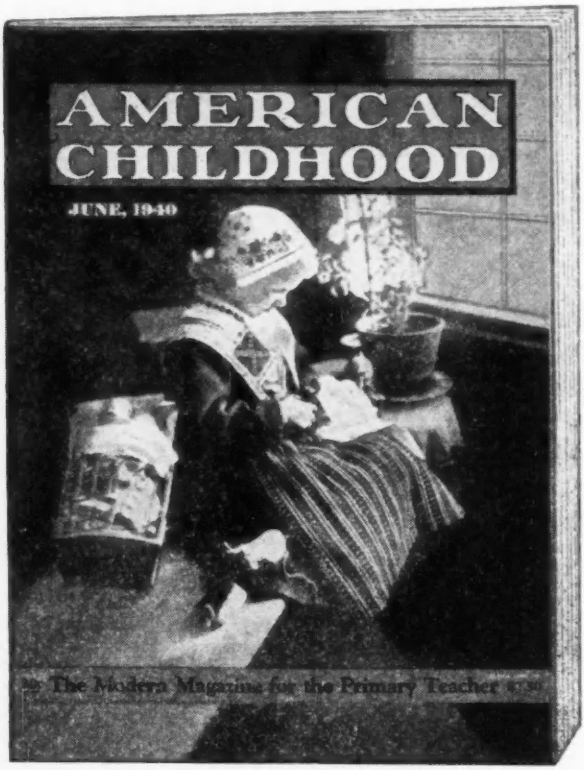

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